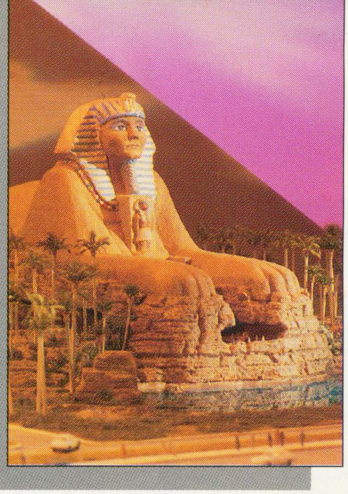
A PennWell Publication October 1993
$4.95 USA
$5.95 Canada

COMPUTER GRAPHICS WORLD



The glitzy, new Luxor Las Vegas hotel offers visitors elaborate special-effects adventures, p. 38.

Exploring the High End of 3D Graphics

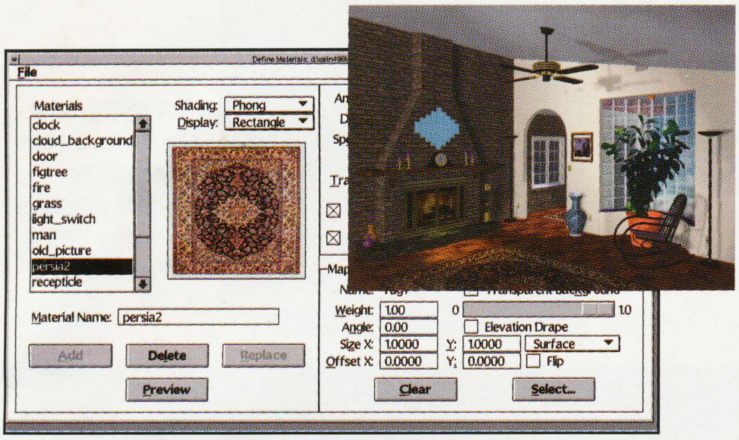
Also:

Scanning in a Colorful World

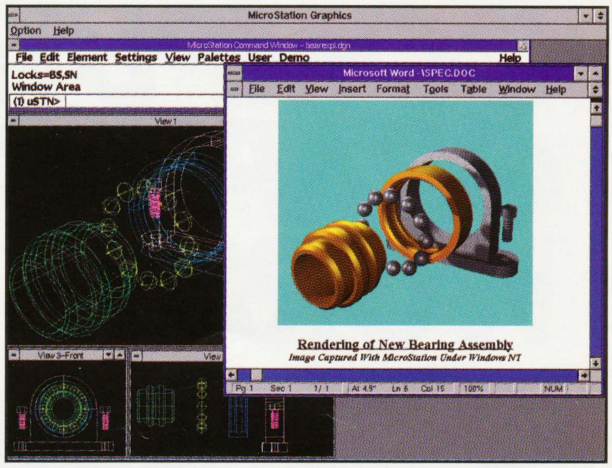
A Beginner's Guide to Multimedia

Choosing a Thermal Printer

10
7 25274 78923 8

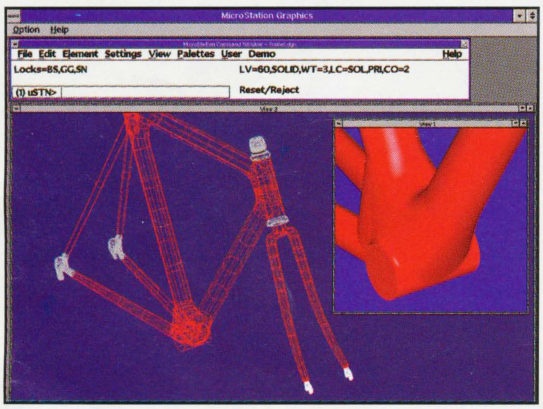


Rendering. *Visualization and flythroughs – at your fingertips! MicroStation offers photo-realistic rendering to every designer, right in the software. It's easy to make your image reflect your imagination.*



Windows. *It walks and talks Windows. Behind MicroStation lies the user-responsive programming you look for in good Windows software. Version 5 gives you the ultimate in integration of CAD, engineering, and business applications.*

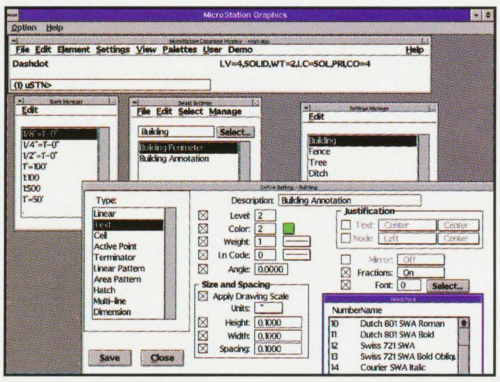
MORE POWER TO YOU.



Modeling. *Model any surface you can imagine in MicroStation. NURBS surface modeling combined with 3D Boolean operations gives you astounding flexibility in creating and modifying freeform models.*

Read & write AutoCAD .dwg

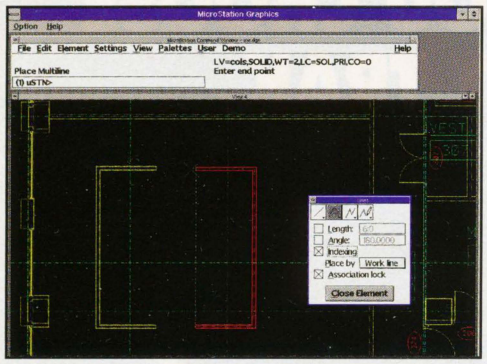
Drafting. *MicroStation gives you first-rate drafting power – without the limitations of old technology. Enjoy the advantages of contemporary features like associative patterning/hatching, plot preview, standard text editing and fonts, and context-sensitive Hypertext help.*



Workspaces. *Choose the design environment that matches your profession or your CAD expertise – even AutoCAD. Complete with custom interfaces, drafting styles, and design environment management. CAD has never been so streamlined!*

easy
Oper
mass pro
Modif
point. *Di*
for future d

Intergraph® is a registered trademark of Intergraph Corporation. MicroStation® is a registered trademark of Bentley Systems Inc., an Intergraph affiliate. Other brands and product names are trademarks of their respective owners. Copyright 1993 Intergraph Corporation, Huntsville, AL 35894-0001. DDAD121B0



Usability. *What does computer-aided drafting have to do with the way you think? Everything. MicroStation software works for you. It understands the drafting process so well that it infers what you'll do next.*

Power. *Take your pick of popular environments: DOS, Mac, Windows, Windows NT, or UNIX. Have a look at MicroStation on Intergraph's Technical Desktop Series personal workstations.*

Graphical User Interface. MicroStation's easy-to-use interface includes pull-down menus, dialog boxes, tear-off tool palettes, and tool settings window. Choose your interface – Windows or Motif – on any platform. *Transparent Modeless Operation.* The software supports the way you naturally work, maintaining command execution while you fine tune: change element attributes or command parameters, manipulate views, change the dimensioning system, and more. *Powerful View Manipulation.* MicroStation supports up to eight active views that can be moved, sized, and overlapped to fit your design. Zoom and area at any scale. Move around your design fast with built-in dynamic panning. *Workspace Editor.* Tailor pull-down menus, dialog boxes, and tool palettes – even disable commands – with a graphically oriented toolset for customizing your chosen interface. *Text Capabilities.* A convenient text editor lets you easily edit single-line or paragraph text. Choose from TrueType, PostScript, AutoCAD SHX, and MicroStation fonts. ASCII text files can be imported and exported. *Multiple Undo/Redo Commands.* Undo mistakes and perform "what-if" designs in a flash with unlimited undo and redo. *Plotting.* Plot raster and vector information by view or defined areas, at any scale. Visually preview the plot before plotting, saving time and materials. *Online HELP.* MicroStation's HELP remains active, tracking the command you're currently using, so there's no searching through manuals for assistance. *Associative Patterning and Hatching.* Associate patterning with graphics. Change graphics and the patterning updates. Flood-fill hatching/patterning intelligently fills an area, detecting boundaries and holes with a single pick. *Associative Dimensioning.* Dimensions are associated with the geometry, not with a point in space, so that when you change the geometry, the dimensions automatically update. *Custom Line Styles.* Create space-saving custom line styles and place railroad tracks, trees, isobars – anything – just as you would place a line. *Multi-lines.* Define line string elements comprising up to 16 parallel lines of varying symbology and store them in a style library for recall. Architects can use multi-lines for fast and easy placement and intersection cleanup of walls and partitions. *2D Boolean ations.* Quickly modify, measure, and hatch multiple 2D shapes with integrated Boolean operations. *Mass Properties.* Calculate area and erties of your model: surface area, volume, mass, centroid, moments and products of inertia, principal moments and directions, and radii of gyration. *ers.* Define relationships among graphic entities with intuitive drawing modes such as tangent, parallel, perpendicular, midpoint, intersection, and end-*nension-driven Symbols.* Based on established relationships, you can assign variables to dimensioned graphics and save the graphics as cells namic placement. Changes in dimensions automatically drive changes to graphics. Dimension-driven design saves valuable time in the design of families of

MicroStation Version 5 puts you in charge.

Call 800-345-4856 for a free brochure on MicroStation Version 5 and the name of an Intergraph representative in your area.

MicroStation

INTERGRAPH

Solutions for the Technical Desktop™

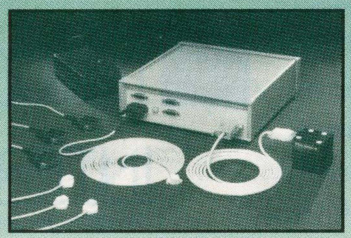
CIRCLE 1 ON INFORMATION CARD

NO MATTER WHICH ONE YOU CHOOSE YOU'RE ON THE RIGHT TRAK.

FASTRAK™
The industry standard for high resolution six-degree-of-freedom 3D tracking with virtually no latency.

ISOTRAK® II
The economical solution for six-degree-of-freedom tracking and 3D digitizing.

Only Polhemus Gives You The 3D Tracking Solution You Need. Whatever Your Application Or Budget.



When accuracy and low latency are the primary consideration, choose FASTRAK. Recently named Product of the Year by both *CyberEdge Journal* and VR '93, FASTRAK's 4ms latency has set an unmatched industry standard. It can accept data from 4 receivers over an operational range of up to 10 feet. Or you can combine 8 systems for a total of 32 receivers. It's the ultimate tracking solution.

For applications on a tight budget, there's ISOTRAK II, the next generation of our proven ISOTRAK. Now with improved accuracy, dual receiver capability and a great new low price. It makes motion tracking, biomechanical analysis, dimensional archiving and other challenging applications a whole lot easier to afford.

Either way, you're choosing the only company who can put you on the right track, no matter what your application.

Find out more. Call (802) 655-3159 ext. 234 for free literature with all the details.

POLHEMUS

First in the third dimension™

One Hercules Drive, P.O. Box 560, Colchester, VT 05446 Phone: (802) 655-3159 FAX: (802) 655-1439

©1993, Polhemus

CIRCLE **2** FOR INFORMATION ON FASTRAK

CIRCLE **50** FOR INFORMATION ON ISOTRAK II

COMPUTER GRAPHICS WORLD

VOLUME 16, NUMBER 10 OCTOBER 1993

DEPARTMENTS

6 **Front End**

9 **News**

12 **Tech Watch**
- A virtual reality link into cable TV
- Designers can't agree? Call AgentX
- Making virtual reality virtually real

21 **Product Spotlight**

88 **Portfolio**

93 **Applications**
- Redesigning the Space Station Freedom
- Modeling a mouse

99 **Product Guide**
- The many colorful choices for thermal transfer printing

104 **Events**

105 **Review**
- Autodesk's 3D Studio Release 3
- Jag II from Ray Dream

108 **Products**

COVER

Animator Marc Pasini of MP Productions (Paris) created our cover image, "The Airstream II Generation," using SoftImage software running on a Silicon Graphics 4D35 workstation. Pasini plans to use the model, which contains 1000 objects and took 2½ months to create, in an upcoming short film titled "The Menace," due to be released next year. Image © Marc Pasini 1993 MP Productions.

FEATURES & COLUMNS

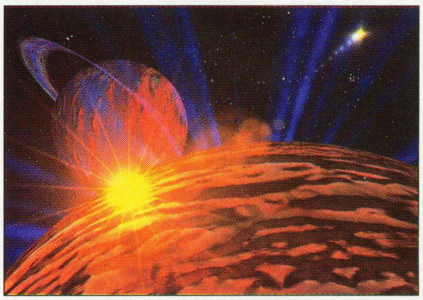
28 **Rendering in the '90s**
Enhancements in speed and flexibility are enticing production houses to use rendering technology to create special effects for TV commercials, feature films, and theme park rides. Meanwhile, sophisticated and clever techniques are reaching a larger audience via desktop computers.
By Barbara Robertson

38 **Time Travels**
Elaborate special-effects adventures created for the new Luxor Las Vegas hotel transport participants to past, present, and future worlds.
By Diana Phillips Mahoney

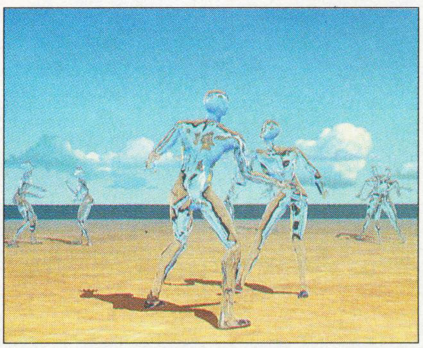
44 **Evaluating 3D on the High End**
Today's software as well as the power and sophistication of the Silicon Graphics platform are now accessible to artists, animators, and designers in large and small firms alike. This first part of a two-part series compares three leading workstation-based 3D modeling and animation packages: PowerAnimator from Alias, SoftImage's Creative Environment, and Explore from Thomson Digital Image.
By Tim Forcade

59 **Scanning in a Colorful World**
The scanner market is undergoing a rapid evolution, and several factors are converging to make scanning a must-have technology for today's graphics professional.
By Kristy M. Holch

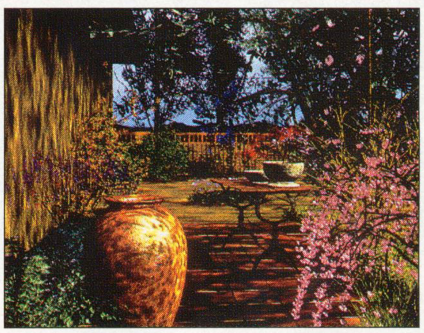
71 **A Beginner's Guide to Multimedia**
As multimedia technology matures, more and more people and companies are using it to deliver their messages. But for those who are new to the technology, getting started in multimedia can be daunting. Where do you begin?
By Elizabeth Wood



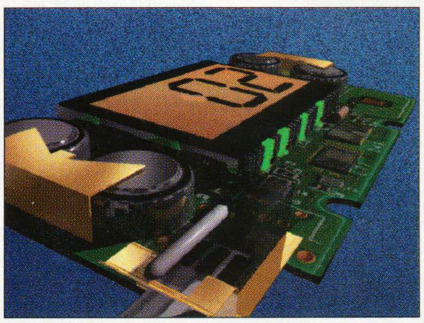
Page 28



Page 38



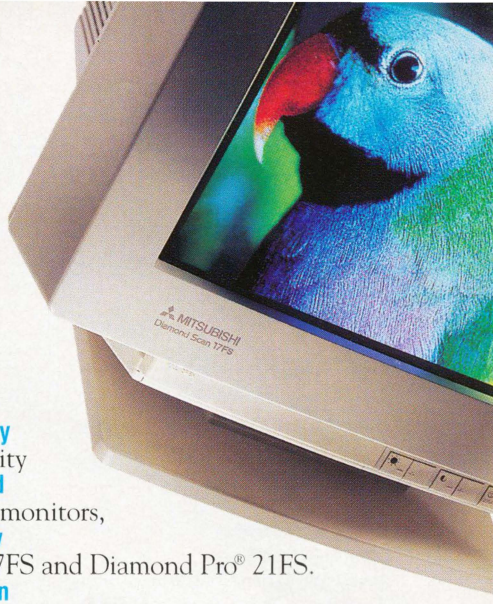
Page 44



Page 71

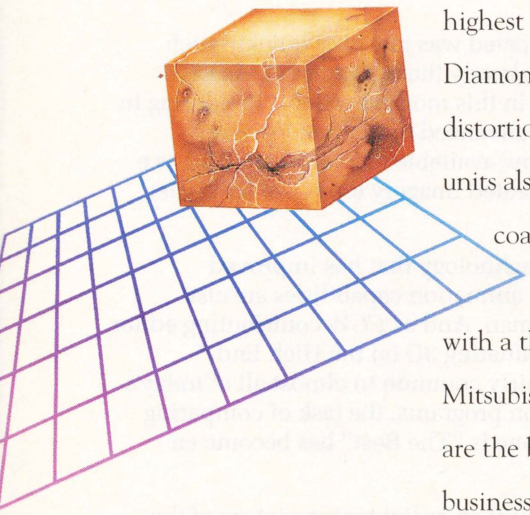
D - BLUEPRNT
Settings Render Model Help
AutoCAD
ZOOM:
All
Center
Dynamic
Extents
Left
Previous
AutoCAD
LAST
DRAW
EDIT

Mitsubishi Flat Square Monitors Give Your World A New Perspective.



Long-Term Durability
Competitively Priced
Three-Year Warranty
Low Emission Design

Explore a brilliant new world of increased display clarity with Mitsubishi's third generation of flat square color monitors, including the Diamond Scan 15FS, Diamond Scan 17FS and Diamond Pro® 21FS. The Mitsubishi 15", 17" and 21" flat square line reduces image distortion and screen glare while delivering high-end performance, quality and features —all at exceptionally competitive pricing. ♦ Each of the models features an ultra-fine 0.28 mm dot pitch suitable for all high resolution applications; an Invar mask for sustained high brightness levels; an ergonomically-designed, compact enclosure with a tilt-swivel base; and easy-to-operate, microprocessor-based user controls on the front panel. To provide the highest levels of display accuracy, the Diamond Scan 17FS and top-of-the-line Diamond Pro 21FS incorporate Dynamic Beam Forming, which reduces image distortion found at the edges of any monitor not equipped with this feature. ♦ Both units also feature Mitsubishi's exclusive new optical quality anti-static and anti-reflective coating on a high contrast tinted CRT. What's more, all three monitors meet strict international guidelines for low magnetic emissions and are fully backed with a three-year warranty on parts and labor. ♦ You also have confidence in knowing Mitsubishi's service and support programs are the best in the business. See our latest —*and greatest*— generation of flat square monitors for yourself. And gain a new perspective on quality, durability and value. ♦ For more information, call us at 1-800-843-2515. In Canada, call 1-800-387-9630 or in Mexico 91-800-83456.



DS15FS: $645 MSRP

DS17FS: $1,299 MSRP

DP21FS: $2,999 MSRP

MITSUBISHI
DISPLAY PRODUCTS

Mitsubishi Electronics America, Inc., Display Products, 5665 Plaza Drive, Cypress, CA 90630
Mitsubishi Electric Sales Canada, Inc., 4299 14th Avenue, Markham, Ontario L3R 0J2

© 1993 Mitsubishi Electronics America, Inc. Manufacturer's Suggested Retail Price (MSRP) subject to change.
Diamond Pro is a registered trademark of Mitsubishi Electronics America, Inc. All other trademarks or registered trademarks are the property of their respective holders.
Screen images produced from the following companies: Autodesk, Inc. (*AutoCAD*); Corel Systems Corp. (*Corel/DRAW*); PCA, Inc.

CIRCLE 3 ON INFORMATION CARD

COMPUTER GRAPHICS WORLD

Stephen Porter
Editor

Audrey V. Doyle
Managing Editor

Barbara Robertson
West Coast Senior Editor

Diana Phillips Mahoney
Senior Associate Editor

Donna Coco
Associate Editor

Michelle Lendway
Editorial Assistant

Contributing Editors: Laureen Belleville, Tim Forcade, John Gantz, Evan Marc Hirsch, Laura Lang, Renée LeWinter, Gregory MacNicol, Joel Orr, Peter Sørensen, Terry Wohlers

Jan Horner
Art Director

Meg Fuschetti, Ann Howard
Illustrators

Lynne M. Guimond
Production Manager

Lona Bassett
Ad Traffic Manager

Bob Wilkerson
Graphics Group Circulation Director

Lisa Hardin
Circulation Assistant

Hope Mascott
Marketing Communications Director

Barrie Mirman
Marketing Communications Manager

Paul McPherson
Group Sales & Marketing Manager

Robert P. Holton
Group Publisher

COMPUTER GRAPHICS WORLD
Executive and Editorial Offices:
One Technology Park Drive, POB 987
Westford, MA 01886
(508) 692-0700 FAX: (508) 692-7806

For subscription inquiries only:
TEL: (918) 835-3161 ext. 400
FAX: (918) 831-9497; TDD: (918) 831-9566

POSTMASTER: Send change of address form to *Computer Graphics World*, Circulation Dept., POB 122, Tulsa, OK 74101

PennWell PUBLISHING COMPANY

Advanced Technology Group

Dr. Morris R. Levitt
Senior Vice President

Leslie P. Cypret
Vice President Administration

Mari Rodriguez
Group Production Manager

Paul Westervelt
Circulation Director

ATTENTION RETAILERS: To carry *Computer Graphics World* in your store, contact International Periodicals Distributors at 1-800-999-1170, ext. 447 (dealer calls only).

PRINTED IN THE USA

Powerful Tools Serve as a Sign of the Times

One of the things that never ceases to amaze me about computer graphics is just how quickly the technology moves forward. It seems like only yesterday, for example, that we were all sitting in the SIGGRAPH Electronic Theater "oohing and aahing" over examples of nicely simulated fog effects, handsomely textured buildings and cars, and realistic depictions of sunlight streaming into rooms.

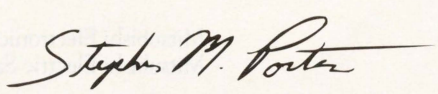
At the time, every new effect, every new texture, and every new example of a realistically modeled leaf or hair or cloud or creature brought feelings of wonder. And yet I also remember thinking at the time how ironic it was that one day we would look at these things that so amazed us and take them completely for granted.

The one thing I don't think I anticipated was just how quickly such things would become commonplace. But already that's happened. As *CGW* senior editor Barbara Robertson describes in this month's article "Rendering in the '90s," today's software programs have advanced to the point where sophisticated rendering capabilities are now available to Everyman. And as a result, our expectations for computer-generated imagery today are far higher than they were only a few short years ago.

Of course, it's not only rendering technology that has improved dramatically. Sophisticated modeling and animation capabilities are also becoming more widely available to Everyman. And as *CGW* contributing editor Tim Forcade points out in his article, "Evaluating 3D on the High End," because these sophisticated features are fairly common to almost all of today's workstation-based modeling and animation programs, the task of comparing packages in hopes of determining which one is "The Best" has become an almost pointless exercise.

Taken together, these two stories paint an enlightening picture of the state of 3D modeling, rendering, and animation technology today. They showcase the kind of work being produced by some of the leading modelers and animators in the industry, they highlight some of the technology trends that are shaping the marketplace, and they offer some guidelines to those who need to know what to look for and what to buy as they set out to create their own computer-generated imagery.

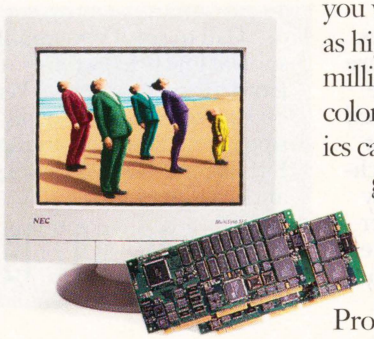
But above all, the stories help demonstrate just how far we've come from those days not so long ago when we got all excited watching a simulated leaf blowing in the simulated wind.



Stephen M. Porter
Editor

SEARCHING FOR THE BEST TRUE COLOR SOLUTION IN THE UNIVERSE?

If you're trying to visualize the perfect true color card, look no further than Pro Graphics™. From Media Vision. The only true color solutions with enough speed, resolution and true color for any visualization need. At a price that's truly affordable. Both Pro Graphics 1024 and 1280 give you workstation quality visualization on your PC. With 24-bits/pixel as high as 1280x1024 and 1024x768 resolution modes. That's 16.7 million colors, full-time, in any mode. And over four times the true color performance of most other popular 24-bit, high resolution graphics cards. What's more, they support the VESA local bus interface to give you up to 133MB/second bandwidth. And since the 1024 costs about half what the competition does, any other claim is just a pie in the sky. So when you're looking for powerful, affordable true color, just look for Pro Graphics from Media Vision. We're creating true color everyone else will be looking up to.

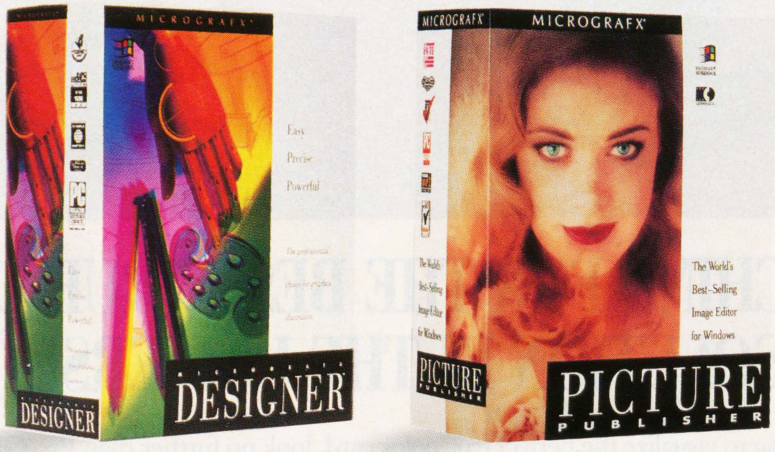


MEDIA VISION

© 1993 Media Vision, Inc., 3185 Laurelview Court, Fremont, CA 94538. 1-800-845-5870. Fax: (510) 770-9592.
Media Vision is a trademark of Media Vision, Inc. All other trademarks and registered trademarks are the property of their respective companies.

CIRCLE 4 ON INFORMATION CARD

Upgrade Now And Prove That Even Artsy Creative Types Have Shrewd Financial Sense.



Competitive Upgrade: $199. Both: $350

Call today for a great deal on two new award-winning graphics packages. Powerful Micrografx Designer™ 4.0 gives you unmatched illustration and graphics capabilities with an easier-to-use streamlined interface. A 32-bit engine delivers symbol creation and placement accurate to within one micron, plus 3-D drawing with rotation and light source control.

New Picture Publisher™ 4.0 pushes image editing ever faster. Only Picture Publisher has advanced features like Object Layers™ so you can move edited images, and FastBits™ that opens just a portion of your file for faster retouching. Getting a great price is even easy and fast. Just call us. But you'd better do it today since this is a limited time offer. After all, we hear creative types work best under pressure.

Call to see if you qualify for our special low price when you switch from most competitive Windows or Mac software packages. Or upgrade from your present Picture Publisher or Designer versions and save even more.

1-800-697-1993

MICROGRAFX®

Micrografx, Inc., 1303 Arapaho, Richardson, TX 75081 (214)234-1769. Micrografx has offices in Toronto, Paris, London, Munich, Milan, Sydney, Madrid, Copenhagen, and Tokyo. Copyright ©1993, Micrografx, Inc. All rights reserved. Micrografx and Picture Publisher are registered trademarks and Designer is a trademark of Micrografx, Inc. All other products are trademarks or registered trademarks of their respective owners.

CIRCLE 5 ON INFORMATION CARD

News in Brief

Founder and Veterans of Defunct AT&T GSL Form New Software Company

Alan N. Wlasuk, founder of Truevision and AT&T Graphics Software Labs (GSL), has teamed up with two of AT&T GSL's former developers to form a software development entity with the charter of creating high-end graphics applications.

Wlasuk founded the Indianapolis-based firm of Wlasuk, Delporte and Davis as a result of AT&T's decision to move GSL to SDO, a division of AT&T located in Orlando, Florida (see "News in Brief," July issue). He has brought with him two veterans of AT&T GSL: Reed A. Delporte, chief designer and developer of the last four releases of GSL's RIO product line; and John T. Davis, who worked on GSL's latest RIO 6.0 version. According to Wlasuk, the new company has begun developing a product that combines Windows NT and Truecolor technologies. The company plans to officially announce the product by the end of this year.

SGI and Nintendo to Create Advanced Video Entertainment Technology

In a move it says will "transform video entertainment," Silicon Graphics Inc. (Mountain View, CA) has joined forces with the US unit of Japan's Nintendo Company to develop a truly 3D 64-bit Nintendo machine for home use.

Based on Nintendo's "Project Reality," the machine is the first application of Reality Immersion Technology, a new generation of video entertainment that enables players to step inside real-time 3D worlds. At the heart of the system will be a version of the MIPS Multimedia Engine, a chip set consisting of a 64-bit MIPS RISC microprocessor as well as a graphics coprocessor chip and ASICs which will provide specialized audio, video, and graphics capabilities.

The product will be unveiled in arcades in 1994 and will be available for home use by late 1995. Target US price for the home system is less than $250.

New Digital Video ICs from Philips

Philips Semiconductors (Sunnyvale, CA) has announced two new chips, targeted at digital video systems designers, that reportedly reduce the cost of digital video I/O on the motherboard of PCs. The SA7189 codes digital YUV video data to an NTSC or PAL composite or S-video signal and accepts CCIR-compatible YUV data with 720 active pixels per line in 4:2:2 multiplexed formats or MPEG decoded data. The SA7196 combines previously separate digital multistandard decoder, digital video scaler, and clock generator functions to increase reliability and cut manufacturing costs. Prices are (in quantities of 1000) $29 for the SA7189 and $32 for the SA7196.

New Chip to Accelerate OpenGL Under Unix and Windows NT

Du Pont Pixel Systems (San Jose, CA) has announced it is developing a 3D graphics chip—code-named GLiNT—for accelerating OpenGL under Unix and Windows NT. In a typical system, geometry transformations will be done by either a fast host processor

such as the Pentium or a dedicated local CPU such as the i860. GLiNT supports 8-, 16-, and 24-bit RGB and 4- and 8-bit Color Index frame buffers for displays as large as 1600-by-1200 pixels. In its maximum configuration, GLiNT will reportedly deliver 300K Z-buffered, Gouraud-shaded triangles per second. The device will be sampling by mid-1994.

Big Three Automakers Address Supercomputing Issues

The Big Three automakers, Chrysler, Ford, and General Motors, have formed a consortium to focus on the development of high-performance computer systems that will "leapfrog" technology currently in use by other automakers, both domestic and foreign. The new Super-Computer Automotive Applications Partnership (SCAAP) is the 12th major R&D consortium formed under the auspices of the US Council for Automotive Research (Dearborn, MI).

A key challenge facing the group will be the development of easy-to-use, portable software that automotive design engineers can run on high-performance parallel supercomputers. To help them in this endeavor, the SCAAP has asked five Department of Energy national labs—Argonne, Lawrence Livermore, Los Alamos, Oak Ridge, and Sandia—as well as the University of Michigan to take part in the initial phases of the program, which will focus on the development of four automotive applications for new parallel supercomputers: fluid dynamics, including fuel flow and aerodynamics; structural mechanics focusing on composites; computer grid-generation technology; and visualization of computer simulations. Once the consortium has agreed on a detailed work plan, it expects to select several commercial software development and maintenance companies to participate in SCAAP-generated R&D work.

Joint Developments

Du Pont Pixel Systems (San Jose, CA) and **Silicon Graphics Inc.** (Mountain View, CA) have entered into a licensing agreement to make SGI's IRIS Inventor object-oriented 3D graphics toolkit available on SPARCstations from **Sun Microsystems** (Mountain View, CA). IRIS Inventor will be ported to SPARC using Du Pont Pixel's PX/IRIS GL, a full-function implementation of SGI's IRIS GL 4.0. Du Pont Pixel is also working on a version of OpenGL for the SPARC; first software shipments are expected in the fourth quarter of this year.

SuperMac Technology Inc. (Sunnyvale, CA) has signed a licensing agreement with **Rocket Science Games** (Palo Alto, CA), a start-up—co-founded by SuperMac's former VP of marketing, Steve Blank—specializing in game software titles. Under the terms of the agreement, SuperMac will have exclusive access to any new video compression technology developed by Rocket Science.

ALSO OF NOTE

• **The Center for Creative Imaging** (Camden, ME) has opened a lab designed for training illustration, animation, and film and video production professionals on workstations from **Silicon Graphics Inc.** (Mountain View, CA).

• **Motion Works Corp.** (Vancouver, BC) has renamed its **Vision Software International** subsidiary **Motion Works USA**. Based in San Francisco, Motion Works USA is the developer of Cameraman, a screen-recording tool for Mac and Windows PCs.

• Beginning this month, **Technical Software Inc.** (Cleveland) will begin marketing, supporting, and distributing to dealers **Autodesk's** (Sausalito, CA) HyperChem molecular modeling software.

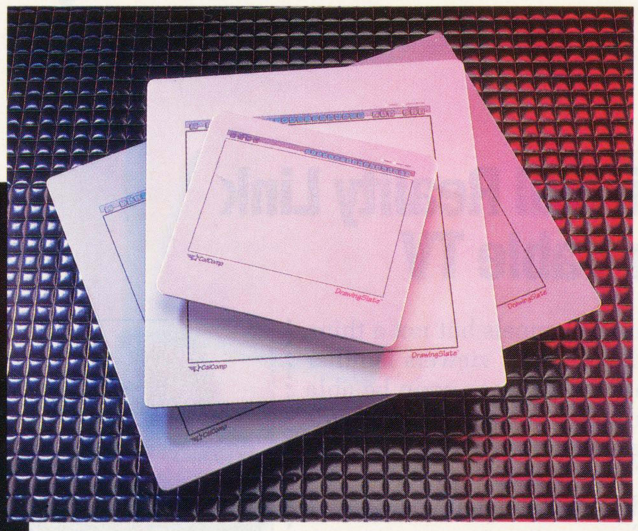
• **HSC Software** (Santa Monica, CA) has announced it has secured exclusive publishing rights to Live Picture in North America. Developed by **FITS Imaging** (Paris), Live Picture enables Macintosh users to perform complex image manipulation on large files in seconds.

• **Cadkey Inc.** has formed a new company, called **Cutting Edge Technologies Inc.** Initially based at Cadkey's headquarters in Windsor, Connecticut, Cutting Edge will focus on developing and providing software designed for manufacturing systems applications.

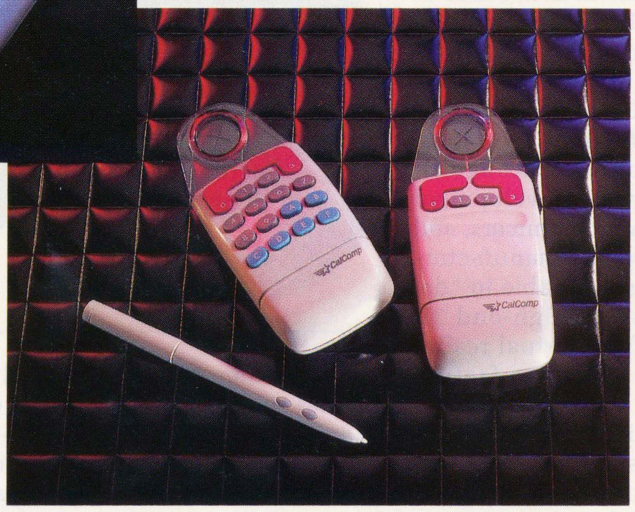
News compiled and reported by Audrey Doyle, managing editor.

Launching Pads.

DrawingSlate
6 X 9, 12 x 12, 12 x 18
From $395



DrawingBoard III
12 x 12, 12 x 18, 18 x 24
From $495



DrawingSlate & DrawingBoard Offer A Choice of Cursors and Pens

CalComp's New Graphics Tablets.

Creativity and productivity can rocket to new highs with CalComp's new graphics tablets.

They offer the latest features — such as pressure-sensitive pens and cordless cursors — all at very down-to-earth prices.

Choose from two families of new tablets to find the model best for you.

DrawingSlate™ From $395

These tablets measure about 1/8" thick, weigh less than a pound and start at $395 for a 6 X 9 tablet with pressure pen. They're available for IBM PC and compatibles and Macintosh and include these key features:

- 6 x 9, 12 x 12 or 12 x 18 inch sizes
- 1,270 lpi resolution
- Cordless pens and cursors
- Pressure-sensitive pen standard with 6 x 9, optional with others
- Lifetime limited warranty

DrawingBoard III®: From $495

It's the third generation of the high resolution DrawingBoard line with great new features. You get:

- 12 x 12, 12 x 18 or 18 x 24 inch sizes
- Up to 2,540 lpi resolution
- Choice of corded and cordless cursors and pens with dynamic sensing capabilities including tilt, pressure and proximity
- Lifetime limited warranty

All tablets provide multiple output formats and are available with Apple Desktop Bus™ (ADB), ADI,® Microsoft® Windows™ and Mouse emulation drivers.

10, 9, 8, 7, 6, 5, 4, 3, 2, 1 take-off to your local CalComp reseller or call for more information now at: **1-800-932-1212 ext. 808.**

We draw on your imagination.™

CalComp
A Lockheed Company

CalComp, P.O. Box 3250, Anaheim, CA 92803. ©1993 CalComp Inc. DrawingSlate, DrawingBoard and We draw on your imagination are trademarks of CalComp.
FAX: 714-821-2714. From Outside the U.S. and Canada, call 714-821-2000.

CIRCLE 6 ON INFORMATION CARD

A Virtual Reality Link into Cable TV

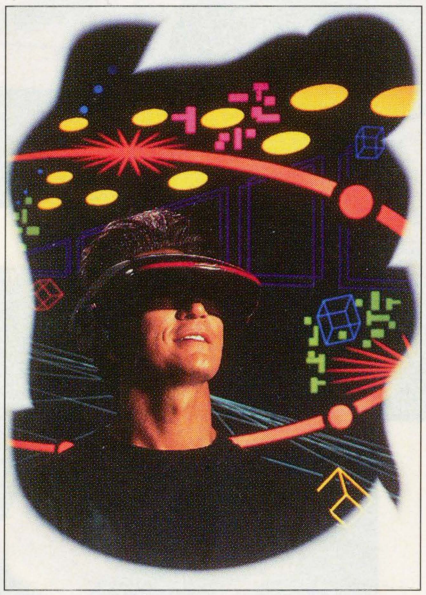
So many channels but not a thing to watch. Cable TV viewers familiar with this lament may soon be able to channel their remote control-clicking energy into a new cable option, if the "virtual" promise of a Colorado entertainment company is realized.

VR-1 Entertainment Inc., based in Boulder, is developing a computer-generated, immersive medium through which 3D virtual reality video games and 3D television will be available to the public via local cable TV companies. Through licenses with software development companies, cable programmers, and consumer electronics manufacturers, VR-1 expects to be able to "deliver to the masses" high-end 3D presentations—from virtual reality games to music videos to feature films—by 1995, according to company president Richard Schmelzer.

The first phase of implementation, which, according to Schmelzer, will occur mid- to late 1994, is going to be "semi-passive," consisting of three-dimensional visual presentations, including guided tours through virtual worlds. By early to mid-1995, in the second phase of the project, VR-1 will download via cable to customers' homes interactive virtual reality games and experiences created by software developers and programmers who have licensed VR-1's software platform.

To bring this technology to market, the company is developing a card that users will be able to plug into their existing Unix-based computers or into cable set-top converters to access VR-1 programs. It is also developing a stand-alone device for the same purpose.

According to Schmelzer, a key factor differentiating VR-1 from



"other systems that call themselves virtual reality but are really very disappointing" will be VR-1's "amazing graphics and [HDTV] resolution." To this end, the company has acquired the exclusive rights to a high-resolution head-mounted display for the home cable market developed by Kaiser Electro-Optics (Carlsbad, CA). "At this time, Kaiser's product is the highest-quality helmet out there, and it's not even one-tenth of what it's going to be in a few years," says Schmelzer.

To create a common platform, the head-mounted display will be able to access a wide array of signals in addition to VR-1's. "We are going to be publishing to game developers, such as Nintendo and Sega, so [their products] can interact with our helmet. VR-1 is undiscriminating in that sense. We don't want to create an environment where there's 20 helmets and 20 different boxes," says Schmelzer.

Eventually, in addition to a helmet port, there will likely be ports for other game interfaces, such as a glove and a joystick, says Schmelzer. "And we also intend to license to companies that make leather chairs, so the games can send information to the customer's box that will control the chair—move it to the left or right or make it vibrate. And other devices could be hooked on to simulate, say, wind and sounds."

Although precise figures are not yet available, the cost for accessing VR-1 will depend on customers' hardware resources, says Schmelzer. "If they already have a RISC-based computer or set-top converter in their house, the cost will probably be in the low hundreds," he speculates. "If they have to buy a stand-alone VR-1 box, it may cost $500 to $700." He adds that, depending on how much customers want to spend, "They will be able to upgrade their systems to create full sense-around entertainment at home." ***—Diana Phillips Mahoney,*** *senior associate editor*

Designers Can't Agree? Call AgentX

Look out, product engineers. If you and your colleagues don't decide on that valve design soon, AgentX may decide for you. And the design whiz will probably show you up.

AgentX is the name of software being developed by Dr. Srikanth Kannapan, a researcher at the Design Research Institute of the Cornell University Theory Center. (The DRI is a joint effort of Xerox Corp. and Cornell.) With the premise that collaborative design efforts usually

You don't need a crystal ball to see where multimedia is going. What you need is a box.

Actually, what you see here is far more than just a box. Our Orientation Kit is your entree to the Apple® Multimedia Program and your direct link to the future of multimedia. So, whether you're a designer, developer, educator, publisher or marketer—or just looking to get involved—you should get with the Apple Multimedia Program. An annual membership fee connects you to some of the best minds and most successful members of the multimedia community. For starters, we'll send you the Apple Multimedia Orientation Kit plus an ongoing supply of valuable tools, information and updates. Membership includes special discounts, a personal AppleLink® address and a "Members Only" bulletin board that lets you tap into technical and marketing tips and techniques. You'll receive how-to guidebooks and videos with advice from proven developers. You'll see how businesses are using multimedia to be more effective and productive in their operations. You'll get key market research reports, so you'll know where the opportunities are. There's even a directory of multimedia products and services, so you can find exactly what you're looking for.

For a membership application, call (408) 974-4897.
That way, the future can't happen without you.

Apple Multimedia Program

©1993 Apple Computer, Inc. All rights reserved. Apple, the Apple logo, AppleLink and Macintosh are registered trademarks of Apple Computer, Inc. This ad was created using Macintosh® personal computers.

require compromise among individual engineers who view the same challenge from many different—often conflicting—perspectives, AgentX is intended to facilitate team coordination, says Kannapan. "[The hypothesis] is that different people approach design projects from different perspectives, and the product itself has different aspects. What we're trying to do is match perspectives with aspects."

To this end, AgentX comprises programs, called agents, into which individual design perspectives are embedded. (The "perspectives" are actually sets of mathematical constraints applied to design problems.) The agents encapsulate design expertise and knowledge that engineers can invoke when collaborating on new designs.

For nearly two years, Kannapan has worked with fellow DRI researcher James Davis, using distributed processing techniques to enable the agents to "collaborate" on a new design and come up with a drawing of a winning concept.

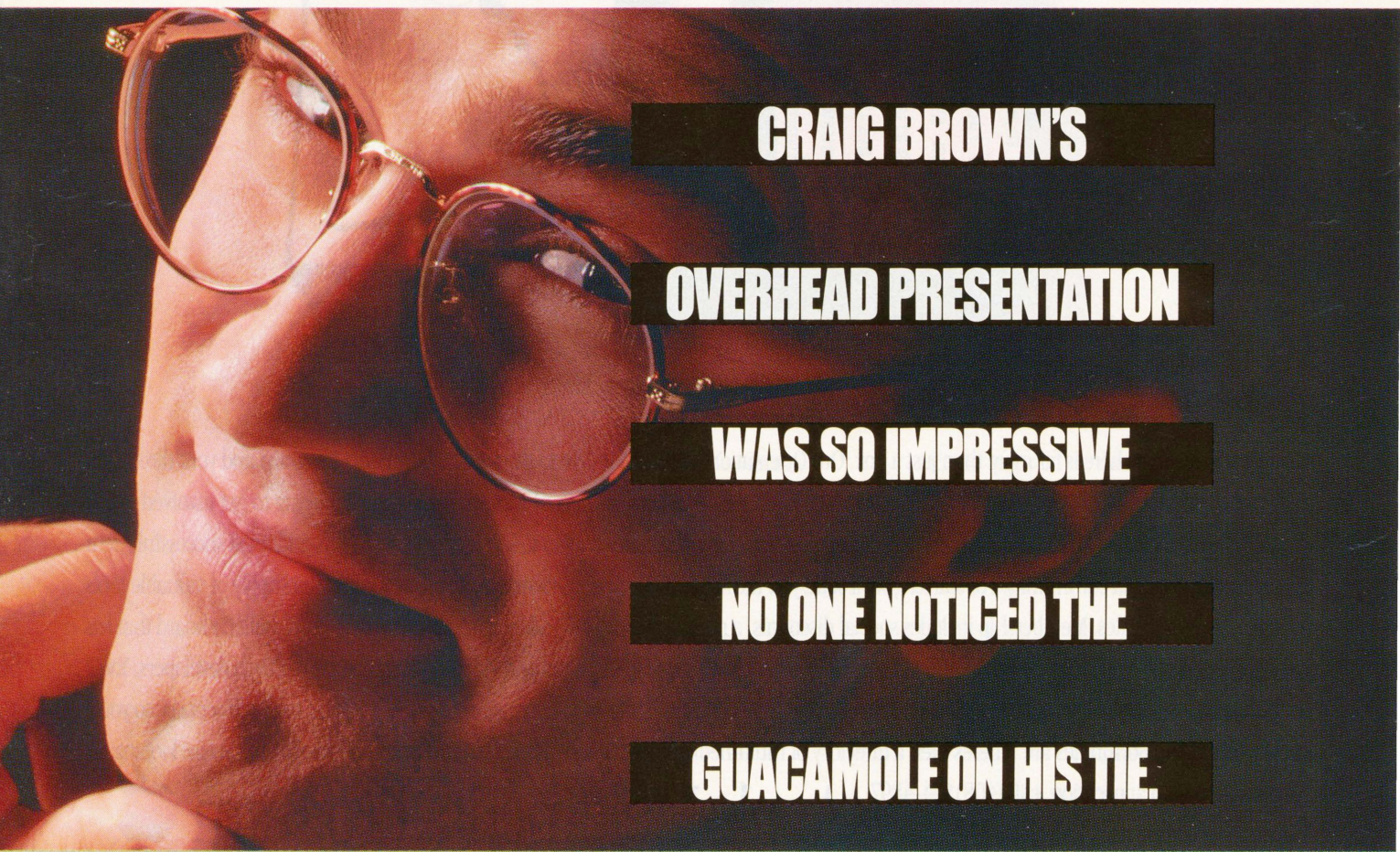
TECH WATCH

"The object is to bring constraints to the table and apply them to products that engineers are designing," says Kannapan. "Essentially, what the agents do is store constraints on [design] parameters. The agents also have knowledge on what kinds of procedures could be used to solve these constraints."

Once these elements are defined, the agents can act on behalf of team members to provide expertise in solving a problem. Representing different perspectives and goals, the agents can apply themselves to a product model. "And there might be other agents connected to the product model that are acting on behalf of another design team," Kannapan adds. "AgentX invokes a negotiation process. It also orders the action of the agents, so you can plan a certain sequence of operations and more than one agent can be running at the same time."

When agents conflict over a design parameter, the program will follow what Kannapan calls "axiomatic protocols" to resolve differences. For example, he says, "For relief-valve design, [designers] use a handbook that contains guidelines for choosing certain parameters. [In AgentX,] we're encoding these into simple linear utility functions that are used in the axiomatic negotiation protocols to suggest agreement values for conflict. And we'll be using this knowledge to look at many different products, even ones we haven't invented yet." Ultimately, the program will take into account the conflicting ideas and constraints and reach the best possible solution.

Kannapan admits that AgentX is still very much in the conceptual stage of development. "We're working on the design process, not on all of the complexities of a product." He does believe, however, that the software will eventually provide a more efficient model for design conflict resolution than humans currently use.—***Arielle Emmett,*** *a freelance writer based in Wallingford, Pennsylvania*



Making Virtual Reality Virtually Real

■ Let's face it, much of what's being touted these days as "virtual reality" isn't *really* virtually real. Often, the huge amount of processing power spent on getting us into virtual environments pretty much precludes the creation of truly realistic models. Another barrier, according to Joshua Lateiner, chairman of the Lateiner Dataspace Group (LDG) based in Woburn, Massachusetts, is the polygon-based modeling used in many virtual reality programs.

"Environments based on geometric rendering engines with polygons and surfaces are limited in the amount of detail they can provide," says Lateiner. In contrast, LDG is pursuing the development of a virtual reality environment it calls Voxel-VR, which is based on "extremely efficient" volume rendering in a parallel environment.

"Volume rendering most closely simulates the way your eyes actually see things and allows you to see not only the surface of a model, but also the inside details as well," says Lateiner. "This voxel [volume element] representation means that you'll be able to have much more physical interaction than the sorts of fly-through behavior that one finds in traditional virtual reality."

Voxel-VR will incorporate the volume rendering technology used in Voxel Visualizer, LDG's commercial volume rendering application for Unix workstations and PCs, which was previewed at SIGGRAPH '93.

While the potential markets for volume-rendered virtual environments are as varied as those for "traditional" virtual reality—entertainment, science, engineering, and architecture, for example—Lateiner believes the primary applications will be found in the medical field, particularly for what he calls virtual surgery.

For instance, he says, "By combining volume rendering with immersive technology and physical simulation, we'll be able to take [magnetic resonance] data, place it in an immersive environment, and create a voxelized version of, say, a hip joint replacement." With this information, he continues, a surgeon can actually examine and interact with the model and determine how the hip joint will fit into the patient by working with the actual patient data. "This type of virtual reality simulation will be possible only with a Voxel VR-type of environment."

Pursuant to the approval of a major grant proposal recently submitted by LDG and Kendall Square Research to the Advanced Research Projects Agency, Lateiner expects Voxel-VR prototypes to be ready within the next 12 to 18 months. In addition to Kendall Square Research supercomputers, LDG is investigating other hardware platforms for Voxel-VR, including the Princeton Engine, Sarnoff Laboratory's massively parallel video computer. —*DPM*

Incredible overheads and prints that rivet your audience's attention. Made easily and affordably. Right at your desktop.

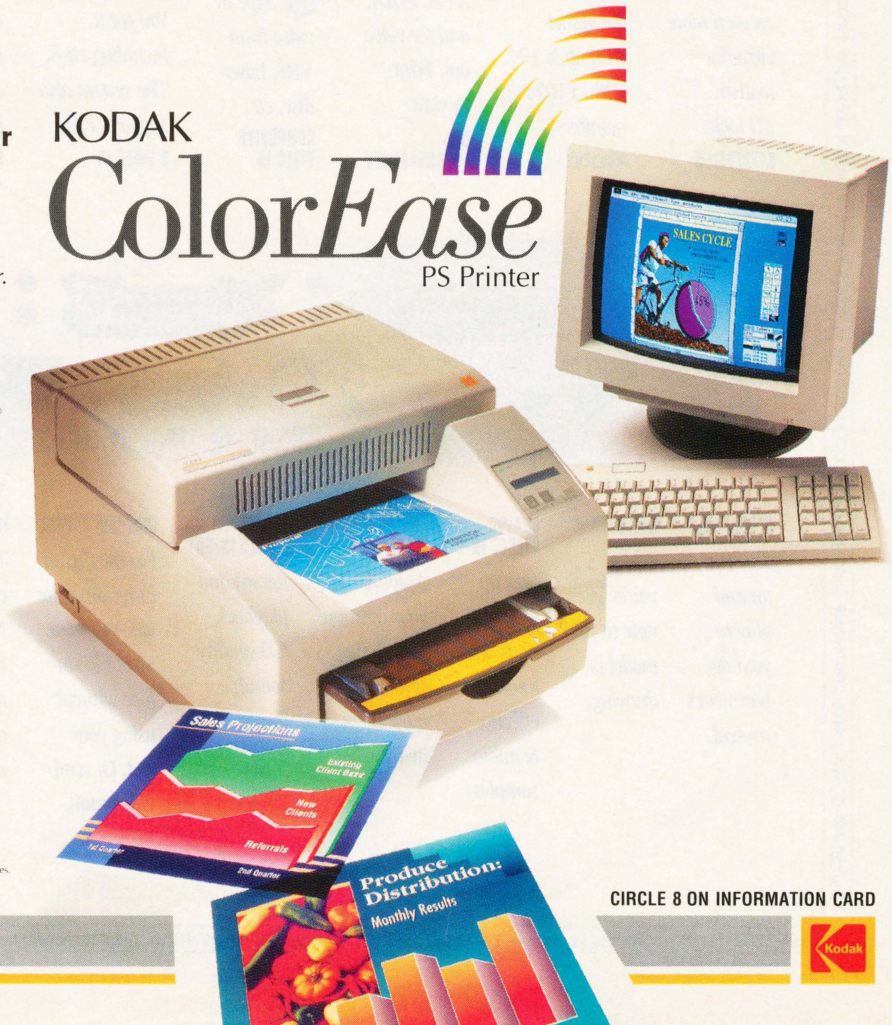
The KODAK COLOR*EASE* PS Printer. Continuous-tone transparencies and prints. Superb resolution. Plus *UltraColor* Software from Kodak that gives you great color the first time, and every time. True Adobe PostScript® Level 2. Fully compatible with your MACINTOSH Computer or WINDOWS Software. With simultaneous printing and processing to maximize your productivity. No other printer can do so much, so fast.

What you eat for lunch is your business. Helping you look your best in your presentation is ours. Give yourself a competitive edge with the KODAK COLOR*EASE* PS Printer. Because nobody knows color like Kodak.

Call 1-800-344-0006 in U.S. or 1-800-465-6325 in Canada for a sample transparency and dealer information.

PostScript is a trademark of Adobe Systems, Inc., registered in the U.S. and other countries. Kodak and ColorEase are trademarks. © Eastman Kodak Company, 1993

KODAK ColorEase PS Printer



CIRCLE 8 ON INFORMATION CARD

digital interactive media presentation package. Digital Media Clip Library, Soundscheme and Prosonus sound library, IRIS Explorer™ visualization application, IRIS Inventor™ 3-D Viewer, IRIS Insight™ documenta-

ANY PORT IN

Stereoscopic glasses for an even more virtually realistic 3D look.
STEREOVIEW

Get the best graphics on the planet with up to 19", 1280 x 1024 monitors.
MONITOR

Roomy enough for two cards. ATM, FDDI, and /or video out. Print to video.
GIO EXPANDABILITY

Pipe in video from VHS, Laserdisc, etc.
COMPOSITE VIDEO IN

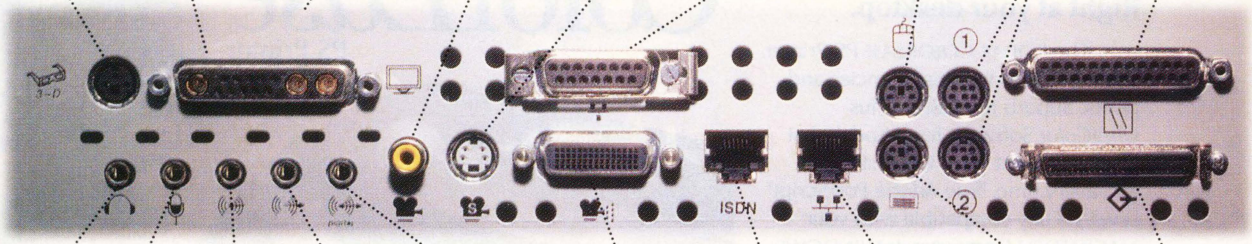
Higher quality? You got it. Including Hi-8. The system also supports PAL.
S-VIDEO IN

Zoom ideas around your office, building, or campus at high-speed.
ETHERNET AUI

The way this puppy reacts to a Silicon Graphics mouse is startling.
MOUSE

MAC-compatible. Talk to anything from modems to midi to your digitizer.
DUAL SERIAL

Don't forget printing and all that. Indy didn't.
PARALLEL



HEADPHONES
Slip 'em on and play to your department's content.

MICROPHONE
Add a voice-note to your model or drawing.

ANALOG STEREO IN
Jazz up presentations with music, effects, & audio samples.

ANALOG STEREO OUT
Amplify your creations. Your design review will blow them away.

DIGITAL STEREO IN/OUT
Record and playback CD-quality sound. Sweet.

INDYCAM™ PORT
For the digital IndyCam color video camera. Meet face-to-face without using your feet. Or send video-mail.

ISDN
Two 64Kbit channels. Network with the factory down the block or a continent away.

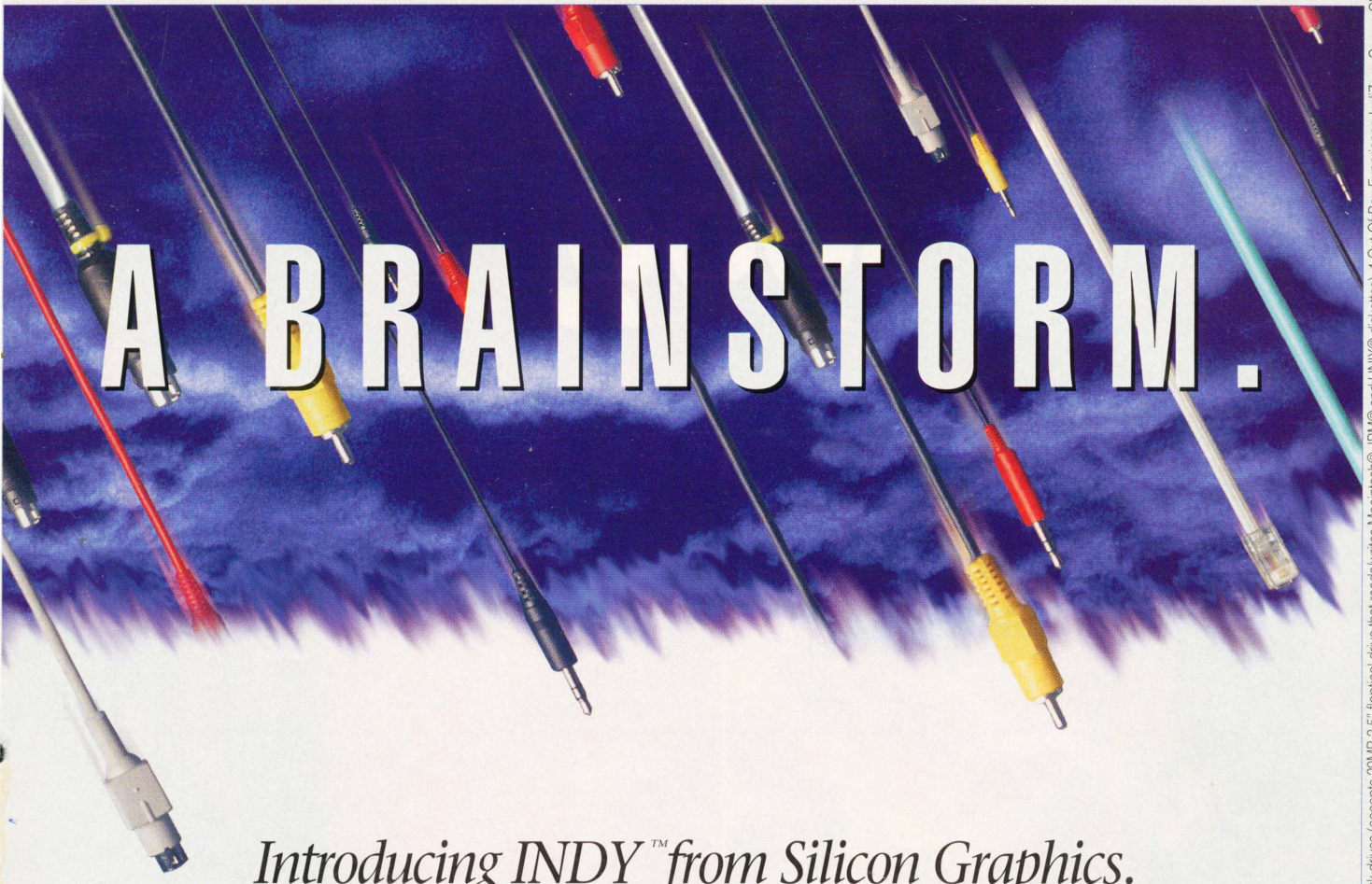
ETHERNET 10BASE-T
A twisted-pair connection to share, deliver, or just play with ideas.

KEYBOARD
The 101-Keyboard is PS2™ compatible, just like the mouse.

SCSI-II
External disk and tape drives, CD-ROM, scanners, Photo CD™, printers, plotters, you name it!

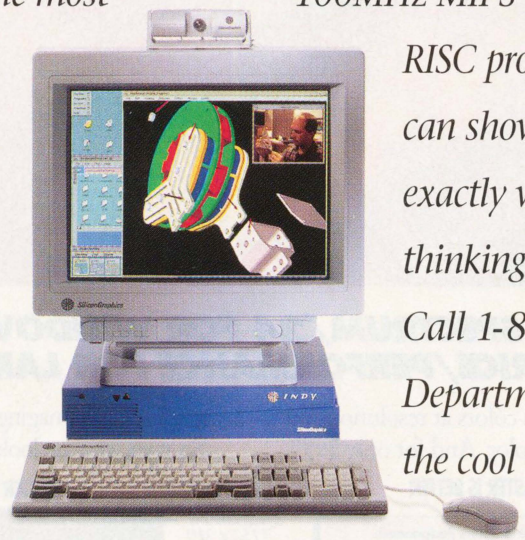
tion Viewer and complete on-line manuals. Getting Started Guide), Hot Mix Application Trial CD (trial copies of Insignia SoftPC 3.1 DOS/Windows emulator and Quorum software application adaptor for Macintosh MSWord™ and MSExcel™), ability to read Kodak Photo CD, and IRIX™ 5.1 &

Motif™ 1.2. © 1993 Silicon Graphics, Inc. Indigo is a registered trademark, and Indy is a trademark of Silicon Graphics. All other trademarks, registered and unregistered, are properties of their respective holders.



Introducing INDY™ from Silicon Graphics.

Welcome to Indy, the world processor. The newest Indigo®. The most affordable. And the first computer with its own digital color camera. The intuitive user interface is a pleasure zone. Capture, create, communicate, and collaborate with the power of a 100MHz MIPS® R4000® 64-bit RISC processor. Now you can show the whole world exactly what you're thinking. Want one? Call 1-800-431-4331 Department B42 for the cool brochure.



INDY

*Starting under $5000.**

SiliconGraphics
Computer Systems

* **The $4995 Indy workstation** includes all the features above, plus: 16MB of RAM (expandable to 256MB); digital IndyCam™ color camera; microphone; 3 juggling balls; 8-bit graphics w/ Virtual-24 support; 15" - 1024 x 768-color non-interlaced monitor; external volume controls; 2 GIO32 high-performance expansion slots; space for 2 hard disk drives (accepts 20MB 3.5" floptical drive that reads/writes Macintosh®, IBM® and UNIX® diskettes); 1 Out-Of-Box-Experience; IndiZone Games CD; Display Postscript®; IndigoMagic™ User Environment (IndigoMagic Desktop, Sound Editor and Filer, Moviemaker and Movieplayer, Video Capture Tools, ImageWorks™ image processing tools, IRIS Showcase™

PERFECT SKIN. $999.

With 8 or 16 bit, you miss a lot. With a small screen you miss a lot more.

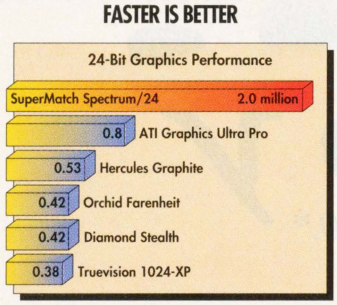
16.8 million colors full 24-bit color for large two-page 1152 x 910 display

SPECTRUM/24 FOR WINDOWS. THE BEST 24-BIT PRICE/PERFORMANCE FOR LARGE-SCREEN DISPLAYS.

Only Spectrum/24™ gives you 16.8 million colors at resolutions up to 1152 x 910. That's two full pages in full color. And for only $999. It delivers a fast 75 Hz non-interlaced display for flicker-free graphics.

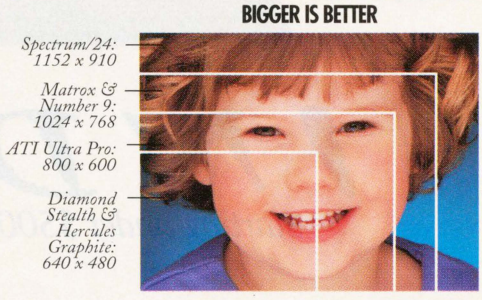
Now you can afford to see all your Windows™-based desktop publishing, presentation graphics, and imaging applications like never before. Big and brilliant. So, if you've been looking for the best price/performance for a perfect picture, stop looking. It's right in front of you.

FASTER IS BETTER



Note: Tests based on the PhotoStones™ 24-bit graphics benchmark performed by Jon Peddie Associates on a 33 MHz 80486-based EISA system. All units are in millions of pixels/second.

BIGGER IS BETTER



For your nearest Authorized Reseller, call **800-334-3005**.

For information via fax, call SuperFacts℠ 800-541-7680.

CIRCLE 10 ON INFORMATION CARD

SUPERMATCH™ by SuperMac Technology

Available for: ISA, EISA, and VL-Bus. card utilizes true-color graphics silicon, 5 custom ASICs, and 3 MB high-speed VRAM. Includes drivers for Windows version 3.1 or later. Display support for 14"-21" multimode displays provides 16.8 million colors at 1152 x 910, 1152 x 870, 1024 x 768, 800 x 600, 640 x 480, with easy-to-use resolution-switching function. Display compatibility with SuperMatch™ 20•T True-Color Display, NEC models 3D, 4D, 5D, 3FGX, 4FG, 5FG, and equivalent displays, and standard VGA-, SVGA-, and VESA-compatible displays, FCC Class B approved. Five-year warranty

©1993 SuperMac Technology, Inc. All rights reserved. SuperMac, SuperMac Technology, Spectrum/24, and SuperMatch are trademarks and SuperFacts is a service mark of SuperMac Technology, Inc. Windows is a trademark of Microsoft Corporation.

Toaster Treats

Proclaiming the end of "blah, blah, blah" television for even novice digital videographers, NewTek (Topeka, KS) has released the Video Toaster 4000, which the company says provides a higher level of performance at a lower price point than its predecessor.

The Toaster 4000, which replaces the original Video Toaster as NewTek's flagship product, takes advantage of the increased capabilities of Commodore's Amiga 4000 computer to offer hundreds of new features. The $2395 product includes a switcher with four video inputs and three internal digital sources. It features close to 300 video effects, from dissolves and wipes with user-adjustable durations to complex digital effects and animated transitions. Many effects feature drop shadows, glints, and smooth, full-color animation.

The Toaster 4000 also includes an integrated graphics loader, which lets users load and display video frames, still stores, and animations. Both still graphics and animations can be displayed with variable transparency and adjustable drop shadows and can be keyed over video sources.

The system includes a 24-bit, 35-nanosecond-resolution character generator which supports PostScript fonts, including automatic kerning and text sizes up to 400 lines tall. With the character generator, users can change font, color shadow, and outline options on a character-by-character basis as well as load brushes from ToasterPaint, the Toaster 4000's 24-bit video paint system. Users can position brushes and text anywhere on the screen using the character generator's mouse-driven drag-and-drop interface.

NewTek has also significantly upgraded LightWave 3D, the Toaster's 3D modeling, rendering, and animation program, with more than 250 new features. Some of these include enhanced rendering options which let users automatically create lens flares and motion-blur effects as well as adjust the depth of field to create images with realistic focusing. A Bones feature lets users create skeletal systems for an object. In addition, image quality has been improved with new color dithering and antialiasing routines, and render times have been increased from 100 to 800 percent.

The modeling portion of the LightWave software has also been enhanced with support for PostScript fonts, which automates the creation of 3D logos and text. The modeler also features new Boolean functions, which let users combine or cut holes in objects. Users can also draw objects with spline curves.

NewTek has also announced a new external rendering engine for the Video Toaster. Called the Video Toaster Screamer, the new engine features high-speed RISC processors which drive the LightWave animation system to reportedly deliver twice the 3D rendering power of a Cray I supercomputer.

Screamer's design is based on four parallel Mips R4400 RISC processors, which deliver more than 600 MIPS of performance. By running each processor at 150MHz with both internal and external caches, Screamer reaches 340 Specmarks.

Screamer comes with NTSC video in and out as well as a complete set of sophisticated 2D and 3D software tools. The product is expected to be available sometime in the fourth quarter for $9995.—*Laureen Belleville, Contributing Editor*

CIRCLE 125 ON INFORMATION CARD

Adobe 'Premieres' on Windows

Adobe Systems (Mountain View, CA) has announced the first version of Adobe Premiere software for the Windows environment. Version 1.0 provides tools for combining video footage, audio, animation, still images, and graphics to create digital movies in either the MS-Video for Windows AVI (audio visual interleaved) or Apple's QuickTime format. QuickTime video clips can be imported for additional manipulation within Windows and exported to the Macintosh for playing and editing.

With the software, commercial/consumer users can insert dissolves, wipes, shutters, and other digital transitions between video clips, still im-

ages, animation, and audio. Plug-in filters, including some of those written for Photoshop, can be used to create color corrections, image enhancements, distortions, and other creative effects. The digital movies created with the new software can be viewed at variable sizes up to full screen, using a variety of compressors.

Adobe designed Premiere 1.0 for Windows to work with other Adobe graphics and digital type products. For instance, users can import graphics created with Illustrator for Windows into Premiere 1.0 and combine them with video and sound. With the program's film-strip file format, users can export video clips to Photoshop for retouching and painting on individual frames (also called rotoscoping).

Some of the product's other features include easy management of all movie elements via a single project file, a user interface that enables users to work in film-strip format using a readily accessible tool palette and multiple windows for easy movie editing, a library of 35 image processing and audio filters, and seven advanced keying features including chroma, luminance, and alpha channels to isolate portions of a clip and superimpose them on another clip. Also, users can preview clips automatically by moving the cursor through a time ruler (scrubbing) and work on low-resolution "miniature" clips for quick editing, then make movies based on high-resolution clips on disk.

System requirements for the new $295 program include an Intel 80386-, 80486-, or Pentium processor-based PC with 8MB of RAM and a 100MB hard drive running Windows 3.1 and MS-DOS 5.0 or greater and either QuickTime/Windows or MS-Video software.—*LB*

CIRCLE 126 ON INFORMATION CARD

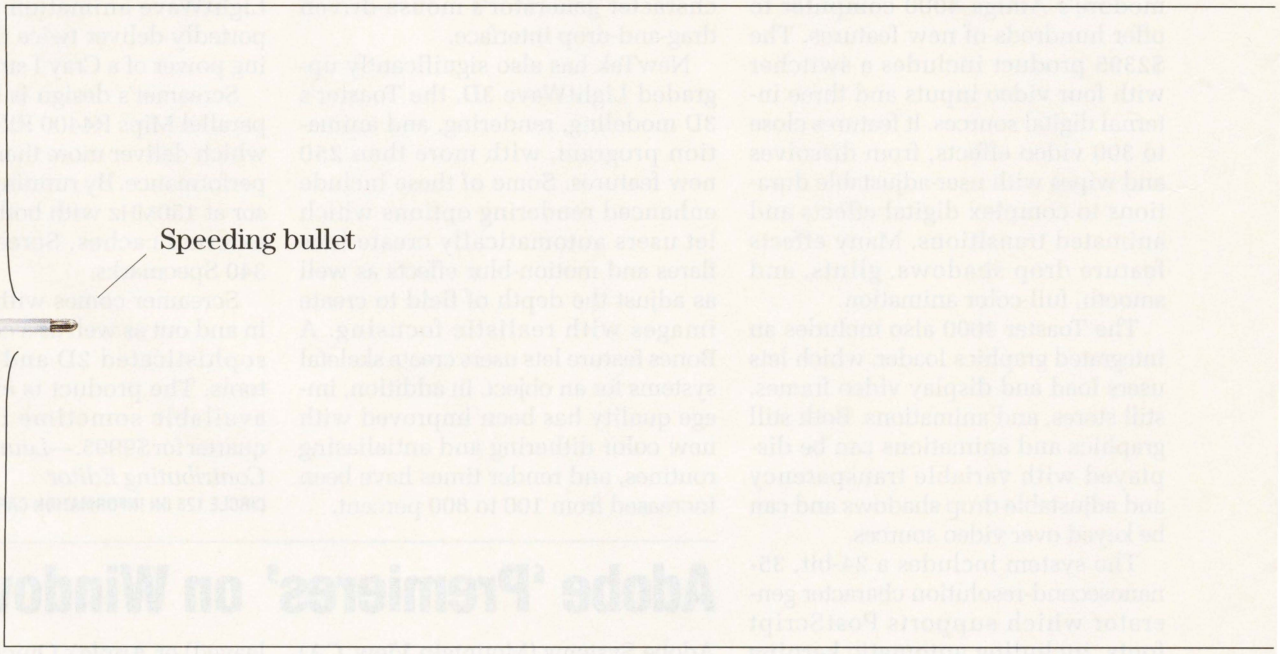
PRODUCT SPOTLIGHT

Annie's Got Her Guns

MetroLight Studios has announced plans to license Annie, a digital cel animation system that offers the best advantages of a general-purpose computing platform to aid in the production of traditional, hand-drawn animation, according to the Los Angeles-based company.

Used exclusively by MetroCel Animation Studios for more than three years for a variety of projects—including recently completed episodes of "Ren & Stimpy," "Beavis and Butt-Head," and several commercial spots—Annie features a patented exposure sheet interface that functions like a traditional exposure sheet, tracking and organizing the animation process. Designed to be used by traditionally trained animators, ink and paint artists, and animation camera operators, the system is easy to use, yet has the flexibility and sophistication of a full-featured computer paint and animation package.

Some of the features include high-resolution, peg-registered scanning, automated ink and paint, and pencil testing. Integrated special effects include shadows, shading, highlights,



You may think of something faster

Sir Chomps-a-lot was digitally inked and painted on MetroLight's Annie system by MetroCel Animation Studios. Image courtesy of Don Bluth Animation.

tegration of live action, 3D animation, and video post effects. Annie's networking features are fully integrated to support studio production, and the system provides mastering to NTSC, PAL, D1, laserdisc, or 35mm film.

Minimum hardware requirements for the $9995 system include a '386/33 CPU with 16MB of RAM, Truevision ATVista 4MB graphics adapter, Truevision ATVMX (acceleration), 500MB hard drive and disk controller, VGA adapter, Sony CPD-1302 color monitor and VGA monitor, three-button mouse, and Wacom SD-510C digitizing tablet.

Later this year, MetroLight plans to launch ancillary services for Annie licensees. One of these is MetroNet, a membership organization of affiliated licensees that will offer a production referral service. MetroLight will also offer a scanning and recording service bureau.—*LB*

CIRCLE 127 ON INFORMATION CARD

blurs, transparency, glows, rack focus, and texture maps.

Annie supports automatic camera moves, trucks, pans and rotates, and sub-pixel motion for smooth movement, even when the camera is moving slowly. It also supports multiplaning and unlimited multilevel compositing as well as the in-

JOLT PSe Provides High-Res Color

The JOLT PSe is a new solid-ink color printer from Dataproducts Corp. (Woodland Hills, CA) that reportedly can render near-continuous-tone output on plain paper.

An enhanced version of the company's JOLT PS printer, the new device contains proprietary software within the controller and printer drivers which gives users several options for enhancing color images to produce near-photographic-quality output. Two controller software enhancements in particular are ImageGrade and Premier Mode. ImageGrade applies proprietary imaging routines to produce faithfully rendered prints from scanned materials; it also enables the printer to operate at its full 300dpi resolution. In addition to generating sharper images, ImageGrade also provides color-correct, near-continuous-tone output. Premier Mode, meanwhile, uses an advanced dot placement algorithm to generate higher quality

HP DesignJet 600 HP DesignJet 650C

than an HP DesignJet plotter.

and more consistent output. In addition to increasing overall print quality, Premier Mode also reduces many banding problems typically found in low-cost ink-jet printers.

Added features include an improved color rendering dictionary—which resides in the controller—for accurately matching colors, gamma correction for providing hue consistency as density increases, and improved paper handling.

The $4995 printer comes with 6MB of memory, expandable to 10MB. CMYK ink pellets are contained in a user-serviceable cartridge. Host interfaces include Centronics parallel, RS-232C and RS-422 serial, LocalTalk, and a SCSI port for external hard drive.—*Audrey Doyle, Managing Editor*

CIRCLE 128 ON INFORMATION CARD

PRODUCT SPOTLIGHT

Alias' New Approach to Cinematics

Toronto-based Alias Research Inc. is taking a new approach to creating cinematic imagery with Alias Cinematics, one of a host of new features available in the latest version (5.0) of the company's PowerAnimator software.

According to the company, Alias Cinematics enables directors to direct digital cinematic effects—such as headlights shining through fog, sunlight in a smokey room, and "Star Wars-like" explosions—as easily as they direct live-action Hollywood productions. Also, directors can produce animations of synthetic characters by directing the actions of live actors wearing motion sensors and digitally simulate physical phenomena such as wind, gravity, and collisions.

Unlike competitive systems, which require that animators specify low-level details explicitly or implement effects via custom programming, Cinematics provides standard effects, such as fog and light glow, which are easily customized via sliders and menu options. Says Phil Neray, director of product marketing, "Directors can now direct digital special effects via simple [instructions] such as 'add fog to the scene' or 'create an explosion here.' For the first time, this gives them access to an easily customizable set of effects for translating their cinematic visions to the screen."

The Cinematics software suite consists of three modules. With Digital OptiF/X, users can create traditional camera and lighting effects using digital techniques and create a range of highly realistic explosions; with MotionSampler, users can create complex animations by performing them with real actors rather than by traditional programming or keyframing techniques (this reportedly speeds up the process of producing long-format animations such as full-length 3D feature films, weekly 3D animated TV series, theme park rides, and new types of video games such as "interactive movies"); and with Dyamics, users can simulate physical phenomena such as wind, gravity, friction,

©1993 Hewlett-Packard Company. PE12312

and collisions between large numbers of objects. Dynamics is fully integrated with the explosive effects tools contained in Digital OptiF/X, so users can couple the visual effects of an explosion with the physical effects of objects exploding.

Besides Cinematics, PowerAnimator V5.0 includes several productivity tools that speed the process of creating complex models and animations. These include a surface blending tool for automatically providing smooth skin at the joints, which is essential for creating lifelike motion of 3D characters; a new parallel ray-caster for faster rendering on Silicon Graphics' Onyx graphics supercomputer and Challenge multiprocessor servers; enhanced Open Digital Studio capabilities for the integration of polygonal data sets and the Silicon Graphics Performer data type; and inverse kinematics constraints, which enable any joint in a hierarchical object to be constrained to a fixed point or to move along a curve or surface.

Alias Cinematics will be available as part of the PowerAnimator Advanced Animation module, which costs $15,000, with free-of-charge maintenance upgrades to existing PowerAnimator users. Surface blending tools and ODS enhancements will be included free of charge with maintenance upgrades to PowerAnimator 5.0. Alias plans to ship PowerAnimator 5.0 by the end of this year.—*AD*

CIRCLE 129 ON INFORMATION CARD

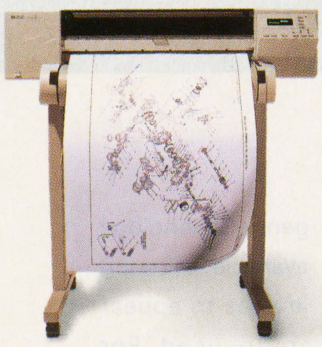
AutoCAD Photorealistic Rendering

Now available from Autodesk Inc. (Sausalito, CA), AutoVision is a still-rendering application with photorealistic image quality that operates within AutoCAD Release 12 for DOS. An AutoCAD Development System (ADS) application from the Multimedia Division of Autodesk, the $795 product is designed to help AutoCAD users produce high-impact images and conceptual renderings by combining exceptional rendering speed with high quality (including ray tracing) and precise control of image details.

The program, which is compatible with Autodesk 3D Studio Release 3, works with a broad range of video displays, from VGA to Truecolor, and can output to screen or file at any resolution on 8-, 16-, 24-, or 32-bit devices. In addition, rendering occurs entirely within AutoCAD, and all rendering information is saved to the AutoCAD .DWG file.

Added features include a materials editor, which lets users control color, reflection, transparency, and ambient characteristics and surface texture; procedural materials, for creating seamless wood, marble, and granite surfaces and altering such characteristics as grain and color; a sun locator, which accurately portrays the sun's intensity and angle at different times of the day and year using latitude coordinates and solar time (users can also select a location from the AutoVision world reference map); and various lighting controls for creating and adjusting point, spot, and distant lights using color, intensity, shadow, and falloff. The program also ships with a CD-ROM containing textures and materials that users can manipuate within the materials editor.—*AD*

CIRCLE 130 ON INFORMATION CARD



HP DesignJet 600

HP DesignJet 650C

HP DesignJet plotters deliver monochrome or color plots faster than you might expect, starting at just $6,495.*

An overstatement? Perhaps. But when it comes to fast plotting, HP DesignJet plotters make their own statement. In less than 3 minutes, the HP DesignJet 600 monochrome plotter produces final-quality D-size plots. In less than 5 minutes, the HP DesignJet 650C gives you the same, but in color. And at our competitive prices, fast plotting is also affordable.

All DesignJet plotters use HP's proprietary inkjet technology to deliver clear, crisp 300-dpi or 600-dpi-quality monochrome plots. In addition, the HP DesignJet 650C, starting at just $8,495,* produces brilliant colors to enhance your output. And we offer Adobe's true PostScript™ Level 2 software as an upgrade for the HP DesignJet 650C.

So don't wait a moment longer for your plots. Call 1-800-851-1170, Ext. 7568 for the name of your HP demo dealer.†

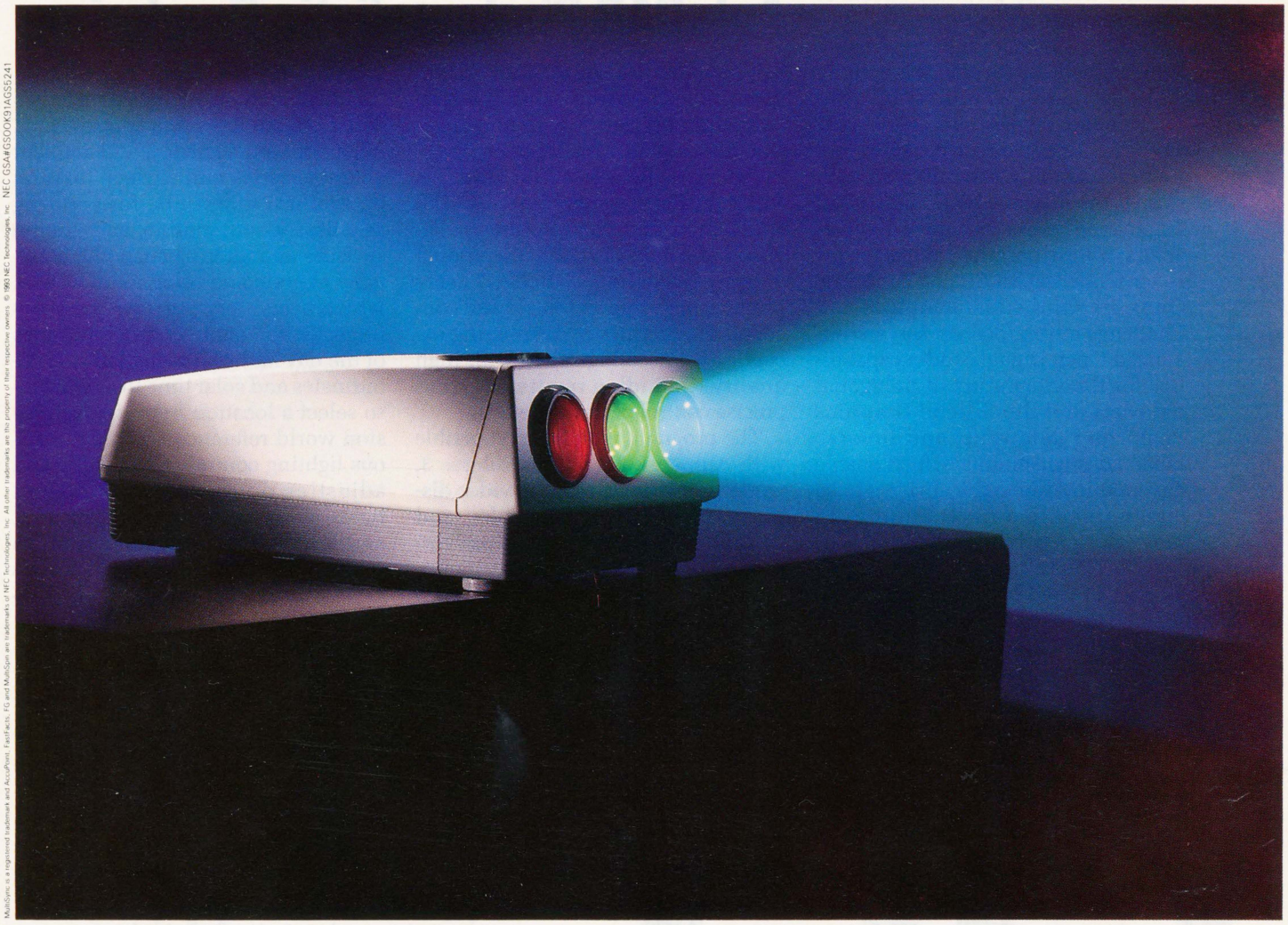
But think fast.

HEWLETT PACKARD

*Suggested U.S. list price. Plot images courtesy of Autodesk, Inc. Adobe and PostScript are trademarks of Adobe Systems Inc. which may be registered in certain jurisdictions. †In Canada, call 1-800-387-3867, Ext. 7568.

CIRCLE 11 ON INFORMATION CARD

Presenting the MultiS



MultiSync is a registered trademark and AccuPoint, FastFacts, FG and MultiSpin are trademarks of NEC Technologies, Inc. All other trademarks are the property of their respective owners. © 1993 NEC Technologies, Inc. NEC GSA#GS00K91AGS5241

Now that computers play such an integral part in presentations, remember, no one presents as many options as NEC. From our MultiSync FG™ monitors to MultiSpin™ CD-ROM readers, and our new 27" 3PG Data Monitor.

In the field of advanced display technology, no one has had a bigger impact than NEC with our MultiSync® monitors. And now, with the introduction of NEC's new MultiSync Projection System, no image will have a bigger impact. The system includes a choice of two projectors, the 6PG or 9PG, a video/RGB Switcher, the ISS-6010, and an Improved Definition Converter, the IDC-2000.

How to sharpen your image.

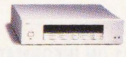
Start with our exclusive AccuPoint™ digital point convergence, standard on the 9PG, optional on the 6PG. This is the most accurate convergence technology available, allowing images to appear sharper and more focused. For added impact, screen sizes are adjustable from 60" to 300" and can be set up for floor or ceiling use and front or rear screen applications. And, with horizontal scan ranges

MultiSync® 9PG Projection Monitor

MultiSync® 6PG Projection Monitor

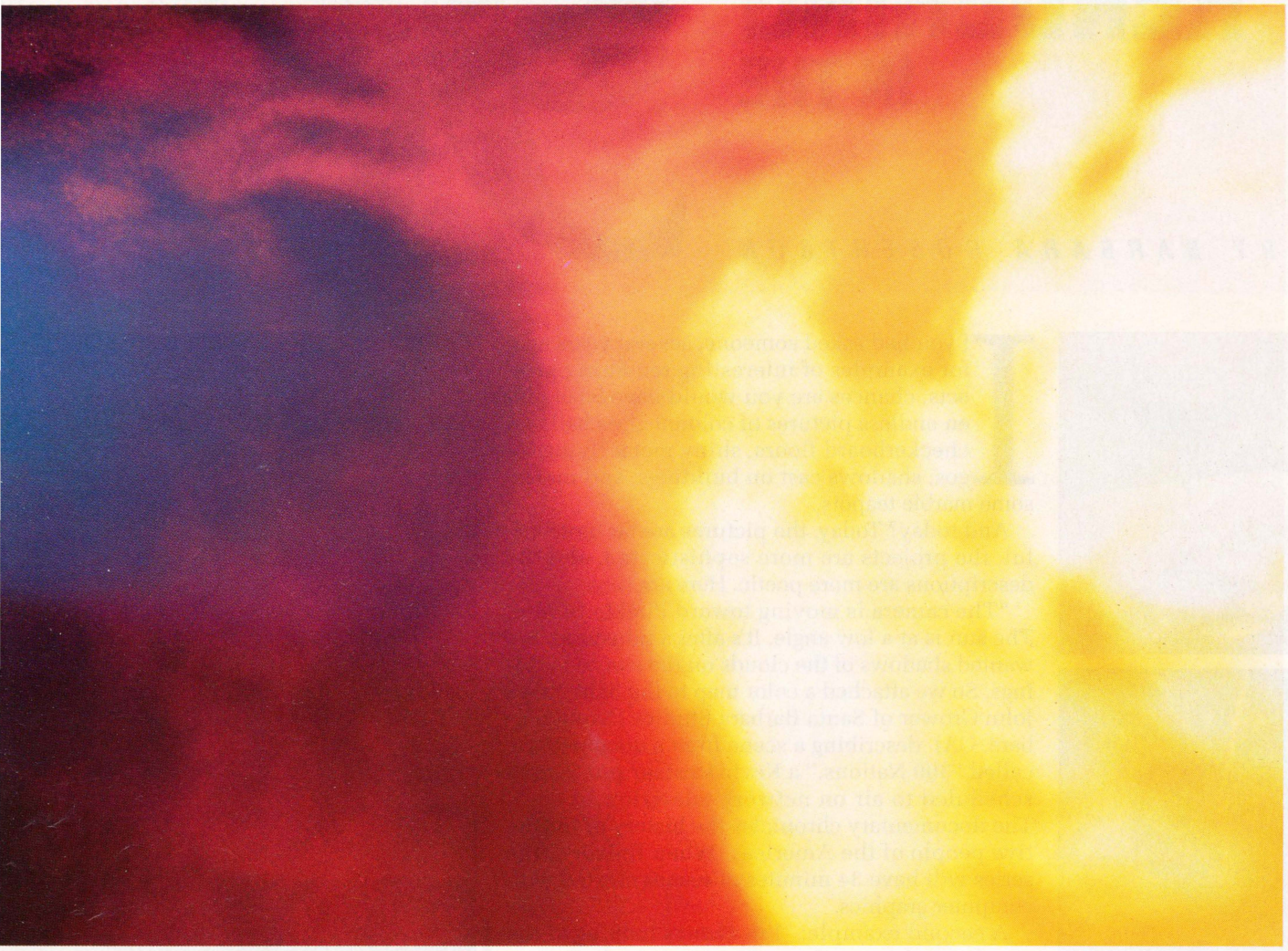
MultiSync® ISS-6010 Video/RGB Switcher

MultiSync® IDC-2000 Improved Definition Converter



ync® Projection System.

(Caution: Screen images explode on impact.)



from 15 to 61 KHz for the 6PG and from 15 to 90 KHz for the 9PG, each projector covers virtually every computer and video source in use today.

How to take control. Easily.

As for ease of use, both projectors may be operated with a software package that enables you to control from one up to 64 projectors, including set-up, right from your PC. Plus, even without a PC, a set of on-screen menus and prompts assists in the operation, set-up and troubleshooting of the entire system.

To bring added impact, the accompanying IDC-2000 transforms low-quality NTSC into images with an almost film-like appearance. While the ISS-6010 gives you complete switching control of one to 100 video or computer inputs, all easily operated from a handheld wireless remote. For more information call 1-800-NEC-INFO. Or for information via fax, call NEC FastFacts™ at 1-800-366-0476, request document 67401. Then prepare yourself for impact.

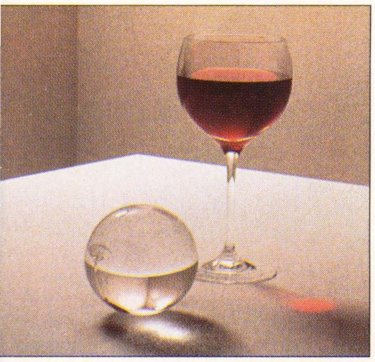
Because ⬆ is the way you want to go.

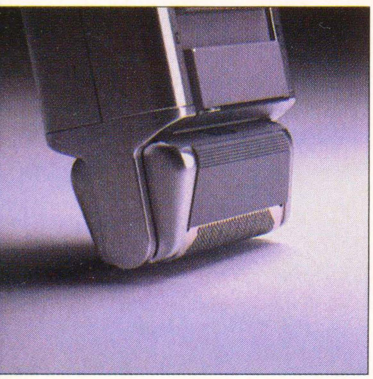
NEC

CIRCLE 12 ON INFORMATION CARD

RENDERING IN THE '90s

BY BARBARA ROBERTSON





To produce 3D scenes such as these, Blue Sky Productions' ray-tracing-based rendering software uses physical laws to determine how light is scattered from the surface of objects.

If you had asked someone, several years ago, for examples of interesting rendering projects, chances are you would have been given endless pictures of colored glass balls on checkerboard floors, shiny metal flying logos, shadows cast on buildings, and maybe some marble teapots.

And today? Today, the pictures are far more artful, the projects are more sophisticated, and the descriptions are more poetic. Here are three:

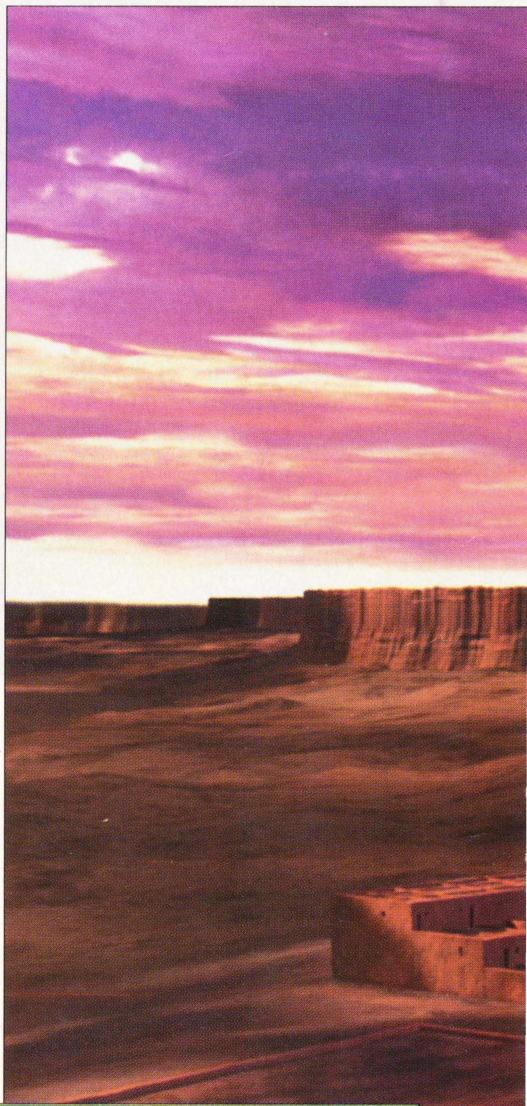
"The camera is moving toward Pueblo Bonito. The sun is at a low angle. It's after a rainstorm. We wanted shadows of the clouds on the stucco buildings. So we attached a color map to the light," says John Grower of Santa Barbara Studios (Santa Barbara, CA), describing a scene from a documentary called "500 Nations," a Kevin Costner production scheduled to air on network television in 1994. The documentary chronicles the history of the native people of the Americas. When finished, the series will have 34 minutes of scenes created with computer graphics.

A second example: "I'm always looking at the way light plays on things in nature, including atmospherics," says Carl Ludwig, director of research and development at Blue Sky Productions Inc., an animation company in Ossining, New York. "I'm always intrigued by sunsets, misty mornings, the surfaces of peaches. When I see something that intrigues me, I sit down and start making pictures."

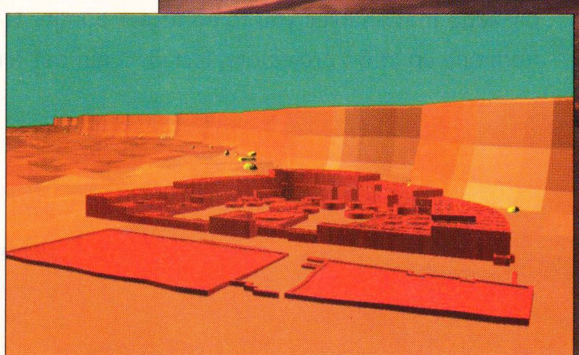
A third: "We're working on a theme park ride for Euro Disney that will take people through Paris 200 years from now," says Steve Gray, software manager at Rhythm & Hues (Hollywood, CA).

Today, people take for granted sophisticated projects such as these, projects that just a few years ago would have been impossible. According to Gray, 50 percent of the projects at Rhythm & Hues are for TV commercials, from 30 to 40 percent are for theme parks, and the rest are for films.

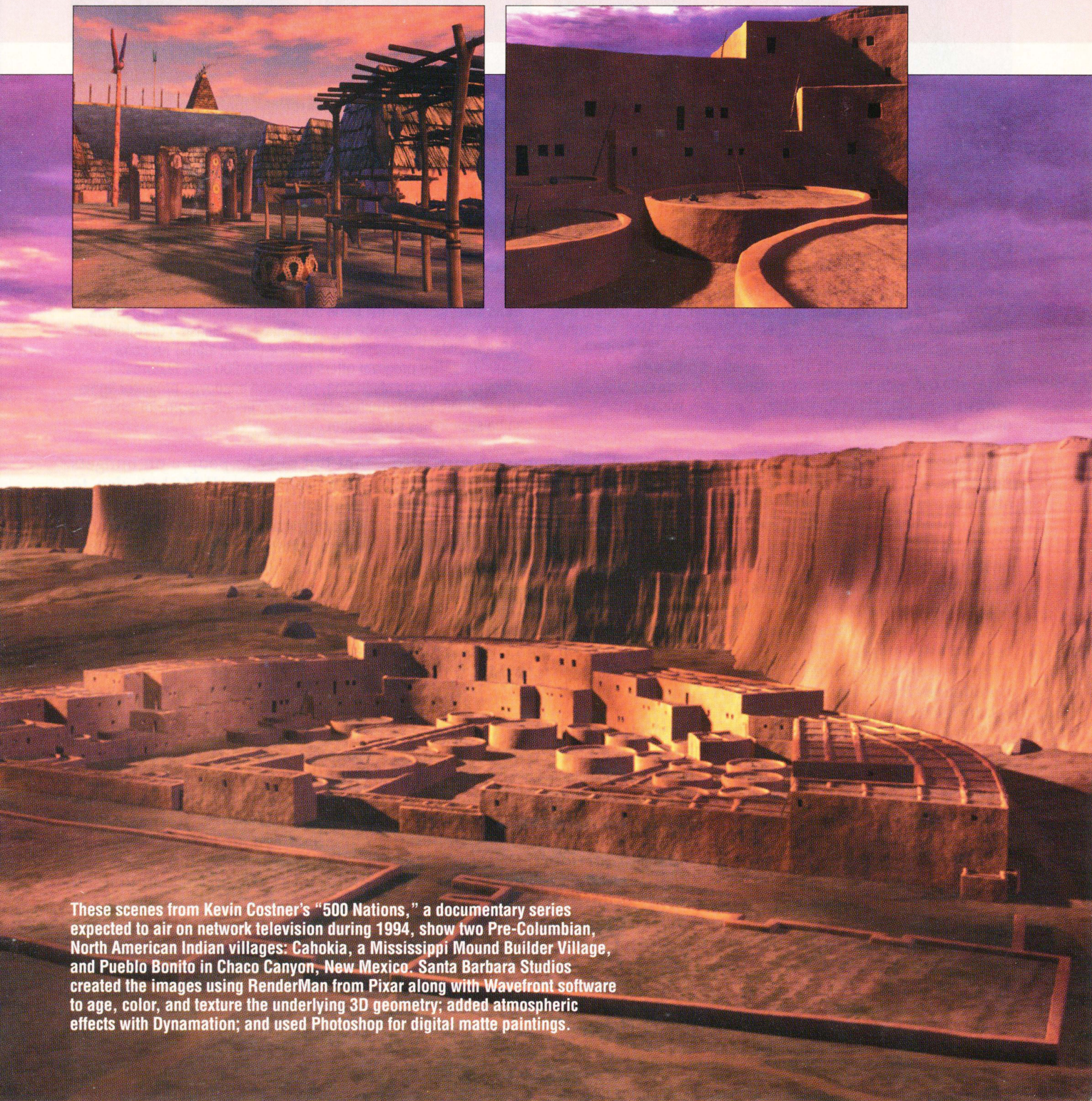
That 3D computer graphics are now accepted by the film community and have become integral to theme park rides is due, in part, to the



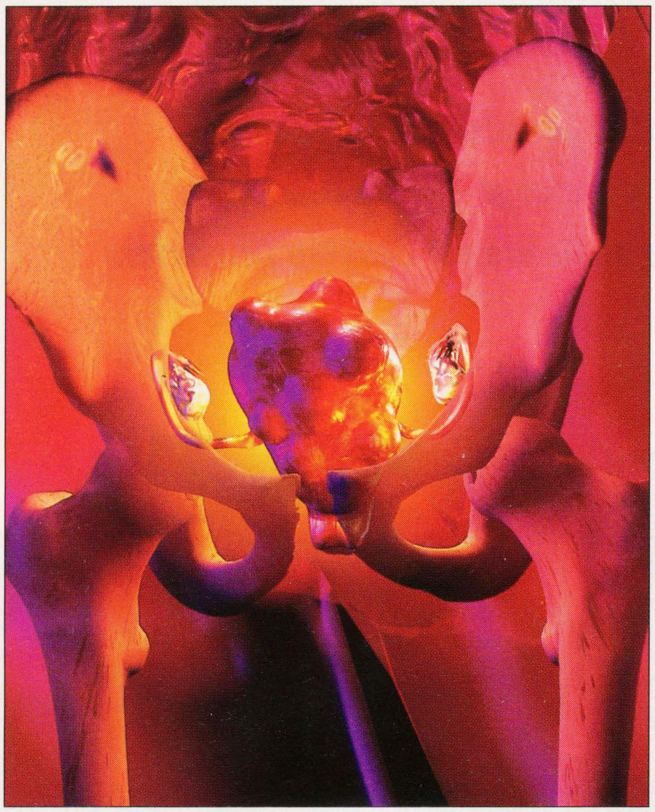
Produced by Santa Barbara Studios for Pathways Productions



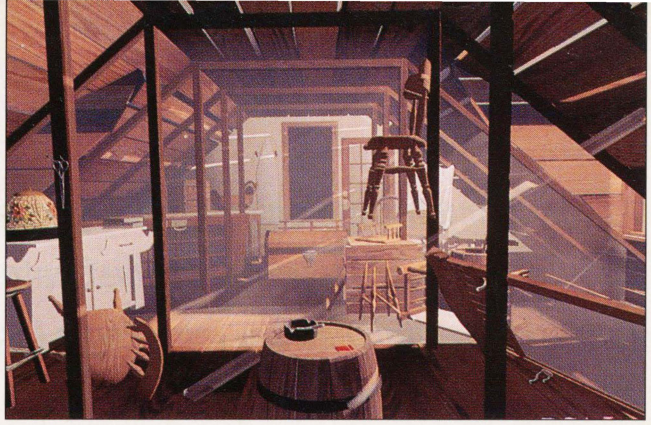
As rendering technology matures, production houses look for speed and flexibility; meanwhile, sophisticated and clever rendering techniques are reaching a large audience via desktop computers

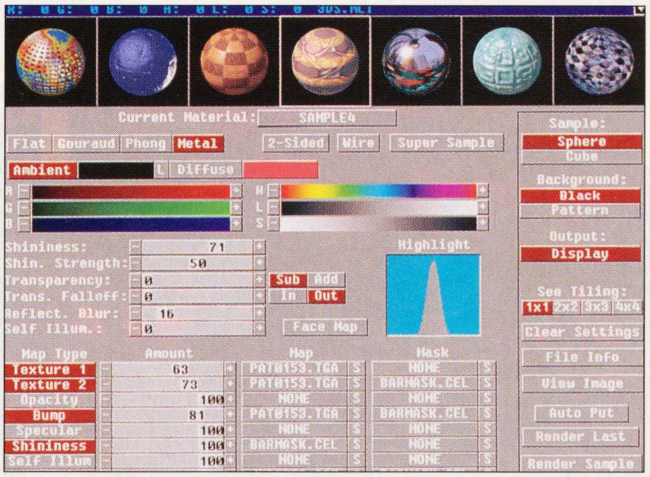


These scenes from Kevin Costner's "500 Nations," a documentary series expected to air on network television during 1994, show two Pre-Columbian, North American Indian villages: Cahokia, a Mississippi Mound Builder Village, and Pueblo Bonito in Chaco Canyon, New Mexico. Santa Barbara Studios created the images using RenderMan from Pixar along with Wavefront software to age, color, and texture the underlying 3D geometry; added atmospheric effects with Dynamation; and used Photoshop for digital matte paintings.



The fibroids on this uterus were created by Donald Grahame of Grahame-Harding Productions (San Francisco) using MacroMind 3D, MacroModel, Miro Hyperspace, Super 3D, MacRenderMan, Network RenderMan, Valis Shaders, Photoshop, and ColorStudio. To model the uterus, he used metaballs. He estimates the total system cost nearly $50,000, with the costs split nearly evenly between software and hardware (Macintosh Quadra 950, Yarc card, Wacom tablet, monitors, and SGI Indigo).





"Gene's Attic," by artist Gene Bodio of PCA (Milford, MA), shows off some of the new rendering capabilities in Release 3 of Autodesk's 3D Studio, which now uses 64-bit color (16-bit alpha) for color calculations. The program offers more than 200 new features—including analytical antialiasing, ray-traced shadows, projector lights, and the ability to use multiple layers of materials—some of which can be seen in this screen shot.

sophistication of the rendering—the coloring, texturing, lighting, and shading—of 3D models and scenes. You needn't look further than your local movie house to find one of the best examples of this sophistication: the dinosaurs created by Industrial Light & Magic for the movie "Jurassic Park" (see "Dinosaur Magic," September issue).

In fact, some people in production houses have begun to take basic rendering techniques for granted.

"The techniques of rendering are all reasonably well-understood," says Gray. "Our problem is not whether we can make [a project] look good, but whether we can do it in a reasonable amount of time. None of the rendering techniques deals very well with huge databases." Databases required, for example, for theme parks.

Thus it's not surprising that software companies catering to this high end of the market now use words such as "fast" and "interactive" rather than "texture maps." Nor is it surprising that production houses which buy commercial software look for programs that can be tailored for a particular job. Which leads to the second set of words most often used by software companies to describe their high-end rendering packages: "programmable" and "flexible."

Custom Rendering

One of the first companies—perhaps *the* first—to separate rendering from modeling and to offer commercial, programmable rendering software was Pixar (Pt. Richmond, CA) with its RenderMan program. RenderMan is now used by animators at Industrial Light & Magic, Disney, and other notable production companies who run the software on workstations such as those from Silicon Graphics. In addition, RenderMan runs on Macintoshes and PCs—which, it turns out, is important not only to people on budgets lower than, say, ILM, but also to people who use PC or Mac software in conjunction with RenderMan.

Santa Barbara Studios, for example, often uses Photoshop on a Mac to create digital matte paintings which become backgrounds in "500 Nations"—a sky, for example—for scenes otherwise consisting largely of rendered 3D models. For rendering: "We're using Wavefront for probably one-third of the job," Grower says. "It's fast and reliable. But it's lacking some features so we went to RenderMan. RenderMan is pretty amazing." It was particularly useful to artists creating the textures in the ancient cities modeled for "500 Nations."

"We had to make things look natural," says Grower. Custom RenderMan shaders—displacement maps—helped them create hand-hewn wood for fences and buildings; fill cracks in stucco buildings with mud; add hand-woven textiles and baskets to interior scenes; carve a wooden table.

Barbara Robertson is West Coast senior editor of *Computer Graphics World.*

To pass up a major profit opportunity, turn this page.

To profit from the digital printing boom, read below.

If you can picture opportunity, this is it.

It's digital photoprinting from METRUM.

It enables prints and transparencies to be made from a number of sources—computer graphics disks, existing photo prints, photo CDs and slides, just to name a few.

In tandem with readily available graphics and scanning technology, the METRUM FOTOPRINT imager or imager/processor allows users to digitally retouch and manipulate photos. Make duplicates without negatives. Combine type, artwork, graphics and photos into a single image. And it's all captured on real photo paper with crisp, 300 pixels per inch resolution and a palette of 16 million colors.

From unrivaled desktop output to greeting cards (with words and photos), real estate brochures to captioned team photos, METRUM is opening a world of opportunity, one that ought to include you.

METRUM FOTOPRINT™

PICTURE THE FUTURE

METRUM
Imaging Products
P.O. Box 5227
Denver, Colorado 80217-5227

Come see us at Seybold San Francisco.

If you sell to the graphic arts industry, printers, service bureaus, corporate communicators or photo labs, you'll be sold on this opportunity.

Join us at the Seybold show in San Francisco October 21- 23, booth 2238. Resellers are encouraged to call for a private product demonstration at the show. Call **Todd Swanson** at **303-773-4603**.

For product literature, phone **1-800-METRUM-2**.

For technical information, phone **303-773-4937**.

Photo courtesy Falconlet

CIRCLE 13 ON INFORMATION CARD

"RenderMan is a very complete language that gives you total control," says Grower. Indeed, RenderMan's flexibility combined with its quality rendering have given many production houses reason to use it rather than the rendering techniques available with the 3D modeling and animation packages. ILM, for example, uses software from Alias (Toronto) for modeling, from SoftImage (Montreal) for animation, and then RenderMan (in conjunction with MATADOR Paint from London-based Parallax Graphics) for rendering. Thus, predictably, software companies seem to be looking for ways to market their 3D animation software as a total rather than partial solution.

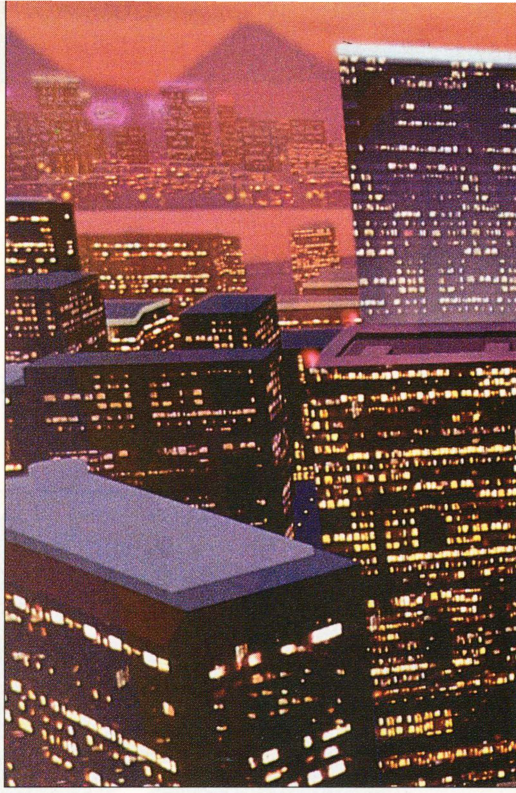
Feature Wars

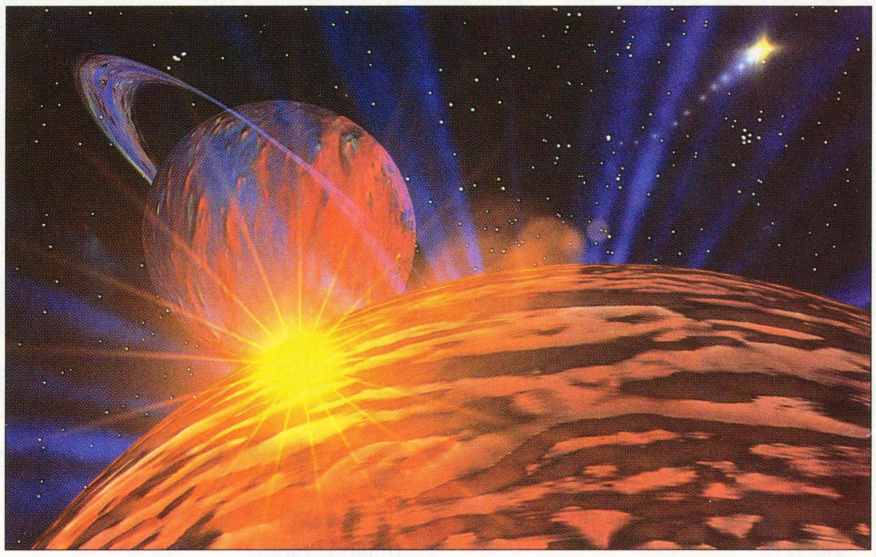
Wavefront, for example, recently bought Thomson Digital Image, which gives Wavefront not only a better modeler but also a renderer known for its ability to do atmospheric effects.

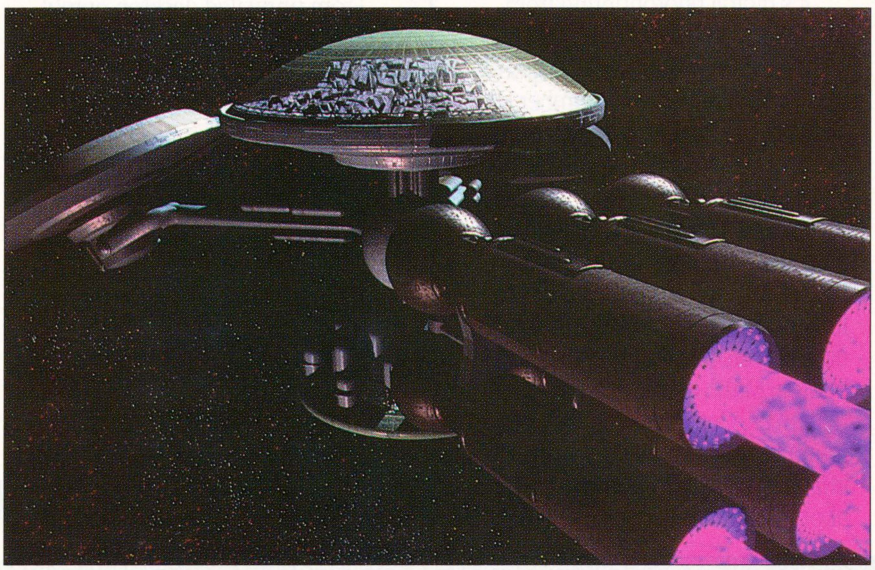
Alias, which links to RenderMan through its "Open Digital Studio," has added "Digital OptiF/X" to its own software to give animators a relatively easy way to create traditional camera and lighting techniques such as lens flare and fog. "You can simulate light through fog by checking the fog box," says Phil Neray, director of product marketing at Alias. In addition, taking a page from the RenderMan book, the company is offering programmable shaders; the advantage Alias promotes is that these shaders become integrated within the user interface.

SoftImage, for its part, has begun integrating rendering software from Mental Images (Berlin, Germany) into its suite of software. Mental Images began developing its ray-tracing software in 1986. Using special algorithms to accelerate the ray tracing, Rolf Herken, president and director of Mental Images, claims the software can now render a car at 1K resolution in two minutes using a combination of Silicon Graphics Challenger and Onyx workstations equipped with 13 processors. Further, he claims, it's the only software that can create "displacement shaders with accurate shadows done in ray tracing." Thus a simple geometric form could be sculpted with a renderer and still cast an accurate shadow. The program, to be called Mental Ray, will include a means for inserting shaders programmed in "C".

Homer & Associates' Peter Conn, for one, can't wait. "I've got my fingers crossed," says Conn of the Hollywood-based production company, "that this will give me the best of both worlds." Conn refers to the programmability of RenderMan and the capability of a ray-tracing-based rendering program.







The light glows, lens flare, halo, and fog effects in the top image were created by Paul Roy using Alias' new rendering software, called Digital OptiF/X, in conjunction with Alias PowerAnimator software.

To create this spaceship for "WorldBuilders Inc.," a 3DO Interactive Multiplayer game to be released by Electronic Arts in 1994, Gingko Design, working with the 3DO company, used Alias PowerAnimator software.

"We liked the shadows in RenderMan," he says, "but we didn't like that the software did it with maps. When you use shadow maps, the size of the scene becomes important. If you're creating a clown with balloons, it's OK. But if you have a whole city, you need a high-resolution map to have decent resolution."

Also convinced of the importance of ray tracing is Carl Ludwig at Blue Sky. "A lot of people bandy about the term 'photorealistic,' " he says. "But most 'photorealistic' pictures don't fool the sophisticated eye." Although the company also creates cartoons (one of which is "Space Boy in Sky High Scramble"), Ludwig's goal is to render images that are indistinguishable from real-world pictures.

To simulate reality, the software Blue Sky developed follows a ray of light from the camera. When the light ray hits a surface, the software determines what happens on that surface, then fires rays into the environment.

"Because the software is based on ray tracing, it was natural to add the physics to calculate the proper way light would be scattered from surfaces," Ludwig says. "These subtle things are what give viewers the cues that make a picture feel right."

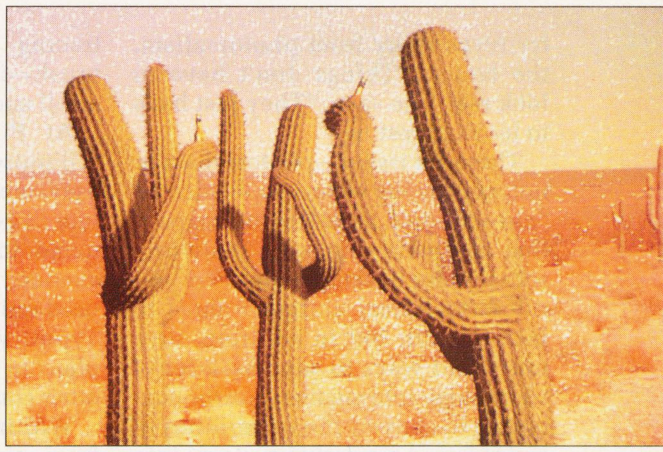
The accuracy of the physical model became clear to Ludwig when he rendered pictures of Earth as seen by a camera flying into space. The renderer changed the color of the sky from pale blue to black as the light changes in the atmosphere, simulating actual pictures of Earth taken on NASA space flights. While convinced that this software approach provides the highest-quality realism, Ludwig acknowledges: "There are different renderers appropriate to different things. The key is in whether the renderer is appropriate to the task."

At Santa Barbara Studios, Grower found, for example, the hardware rendering capabilities of SGI workstations, combined with the Dynamation software the production company created for Wavefront, were sufficient to simulate such effects as smoke rising from a cooking fire.

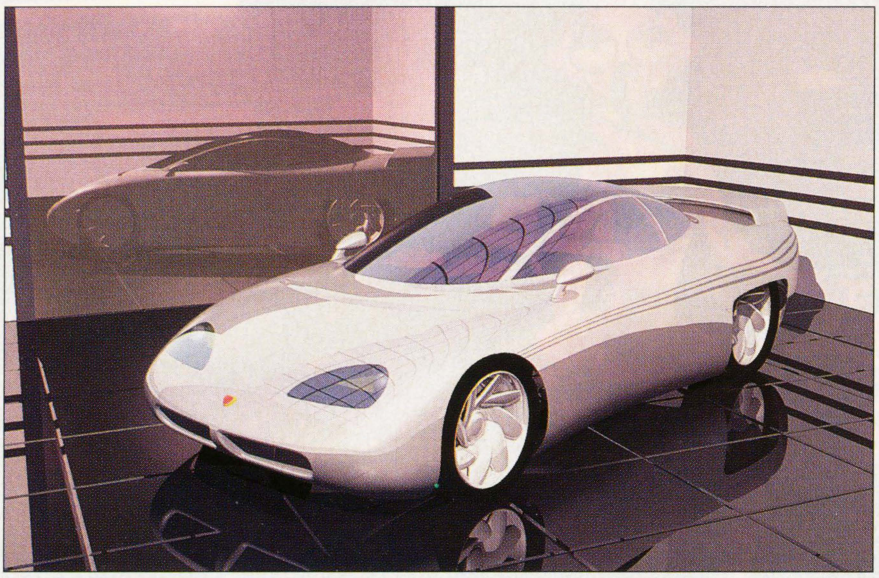
Further, for many of the renderings he does, Grower uses reflection maps created in RenderMan instead of ray-tracing techniques. "It's a lot faster to project the shape of a window frame on the wall and have a shadow," he says. In addition, "Ray tracing, because it's exact, is unforgiving."

At Rhythm & Hues, Steve Gray finds that many art directors are not fans of reality. "A lot of commercial production is not supposed to be real," he says. Thus a lot of times, he believes, reflection maps work as well as ray tracing.

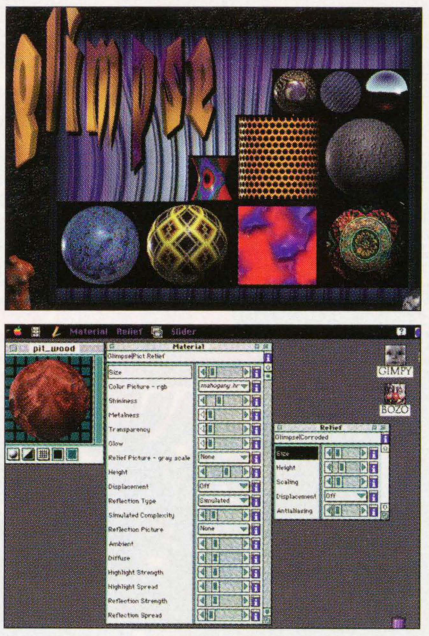
Indeed: "Why should people be so obsessed with photorealism?" asks Mark Watt, co-author with Alan Watt of the book "Advanced Rendering and Animation Techniques (1992, Addison-Wesley Publishing Co.; Reading, MA). Now working at Xaos Inc. (San Francisco), a production company whose "work is definitely not photoreal, so I won't be spending my time making pictures of hotel rooms," Watt believes the sooner the computer graphics indus-



Artists at Rhythm & Hues use custom software that puts multiple processors to work on individual frames to render the huge files needed for animations such as (top) "The Guardian," a theme park simulator ride created for Kia Motors for the World Expo in Taojon, Korea, and for TV commercials such as the photo-surreal Miller "Cactus."



Some people say that if you want a true test for the photorealistic capabilities of rendering software, you should try to render the subleties of the freeform surface of a car. This car, created with CDRS trimmed freeform surface geometry from Evans & Sutherland, was rendered by Mental Ray software from Mental Images, which provides rendering software to Mercedes-Benz. Mental Ray will be folded into the SoftImage Creative Environment this year.



To create the pyramid of 3D "Looks" for this illustration, John Berg, artist and technical support specialist at Pixar, used that company's new Glimpse program. As the screen shot from Glimpse suggests, the program provides menu-driven access to the RenderMan shading language, giving people the ability to manipulate the surface attributes such as "shininess" of "Materials" such as wood, then combine the result with "Reliefs" (displacement shaders) to, for example, sculpt a pattern into the material.

try turns away from photorealism, the better. "Things don't have to look real," he says. "They just have to look interesting."

These are issues—photorealism or not, ray tracing versus sophisticated "cheats" such as reflection maps—that companies creating rendering software for desktop computers and a less technical audience have to face as well. But in addition, they must find ways to squeeze a lot of technology into smaller, slower boxes and to convert the capabilities of script-based rendering systems into workable user interfaces.

And as often happens when software companies create tools for relatively non-technical people using bitty boxes, the software gets creative.

For example, Ray Dream Inc. (Mountain View, CA) realized that many graphic artists using its Mac-based 3D software did a lot of post-processing on rendered images, so the programmers decided to output information about the geometry with the rendered image in a file they call a "G buffer." "If you want to paint some fog on a ray-traced image, you could use the data in the G buffer to change the orientation of the brush based on the geometry," says Pierre Berkaloff, chief technical officer at Ray Dream. In addition, Ray Dream artists can, within the 3D program, paint on a rendered object and the software changes the ray tracing for the spot under the brush—interactively if the brush is small enough.

At Pixar, the company's new "Glimpse" software gives people an easy, menu-driven way to manipulate "Looks," the company's trade name for its custom RenderMan shaders. (Currently, Looks can be used only in Pixar's ShowPlace and Typestry programs; however, Pixar plans to provide access to Looks for other companies.)

Within Glimpse, users can move from simple default menus into "Power User" and "RenderMan Expert" modes for more choices, complexity, and control.

Tools such as these for personal computers, and a long list of others such as those from The Valis Group, Electric Image, Strata, Specular International, CrystalGraphics, Digital Arts, VIDI, and MacroMedia, among many others, are bringing rendering techniques to the mass market.

It's likely that as people become adept in the world of 3D, the demand for sophisticated techniques will grow, as will the awareness of what constitutes quality rendering.

Desktop Sophistication

Clearly, personal computer software companies are already learning why rendering on high-end machines often looks better. It's not, as Gary Yost found out, simply that workstations are faster. "Photorealism starts with color purity and antialiasing purity," says Yost. "If you haven't handled both of those correctly, you might as well give up." It was a revelation that caused the Yost Group, creators of 3D Studio from Autodesk (Sausalito, CA), to completely rewrite the rendering system for 3D Studio Release 3. The new version (which boasts more than 200 new features) now uses a 16-bit-per-channel, four-channel color model. "We compute 500 billion colors," says Yost, "then do gamma correction, then sample down to 24 bits. Then we think about antialiasing. Once we had that taken care of [in the software architecture], we began to work on textures and texture filtering."

Yost believes the work entailed in designing this new architecture and in rewriting the software will be rewarded in the marketplace. "Our customers are getting sophisticated enough now to compete on quality," he says.

It's a statement that reflects just how much that (mass) marketplace has changed already. *CGW*

A Smart Read.

You know how fast your industry is changing. So, how do you keep on top of it all? You're doing it right now by reading a PennWell Graphics Group publication.

As you grow professionally, PennWell grows with you. Because only PennWell gives you a complete family of four award-winning magazines that cover every aspect of the computer graphics and electronic publishing industry. Every publication provides you with the news that affects you and your career, plus informative, objective reporting on all the emerging technologies, products, and applications. You get product reviews, insightful articles, and thought-provoking editorials about important issues and trends in the industry.

No matter how you're involved in computer graphics or publishing, PennWell has you covered with a complete range of professional publications.

Call and subscribe to the publications that are right for you and your business. **918-835-3161 Ext. 400.**

A Smart Buy.

Where do you find the industry's most influential readers? Right here in one of these PennWell publications. Only PennWell gives you this kind of coverage — 436,000 industry professionals representing 80% of the market. And you can reach them with any of our four in-depth, cost-efficient publications covering every aspect of the computer graphics and publishing industry.

These are the serious buyers. They buy in volume, making major investments in equipment & software. They need to know about the solution that you're marketing. In fact, 95% of the combined readership of these four publications are buyers.

Look at it this way: a media buy that reaches this many buyers of your product is one smart buy. And with our Publishing Plus! Program – that offers up to 30% in discounts – it borders on sheer genius.

Call Paul McPherson today for information on the smartest media buy in the business. **508-392-2168.**

Computer Artist, the newest PennWell publication, is written for art/creative directors, graphic designers, and illustrators. *CA* provides comprehensive information on the techniques, products, and services necessary to work with today's new electronic tools.

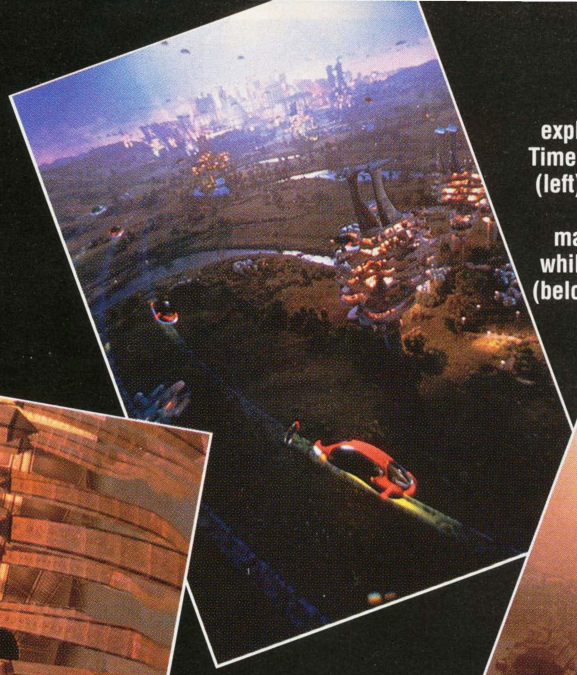
Computer Graphics World is the premier magazine for the computer graphics industry. It provides in-depth coverage of modeling, animation, and multimedia technologies and products across a broad spectrum of commercial applications.

Color Publishing is a comprehensive source of information about the evolving market for color publishing systems. It strives to make technology understandable to newspapers, service bureaus, designers, inplant, and publishing professionals so they can make informed decisions.

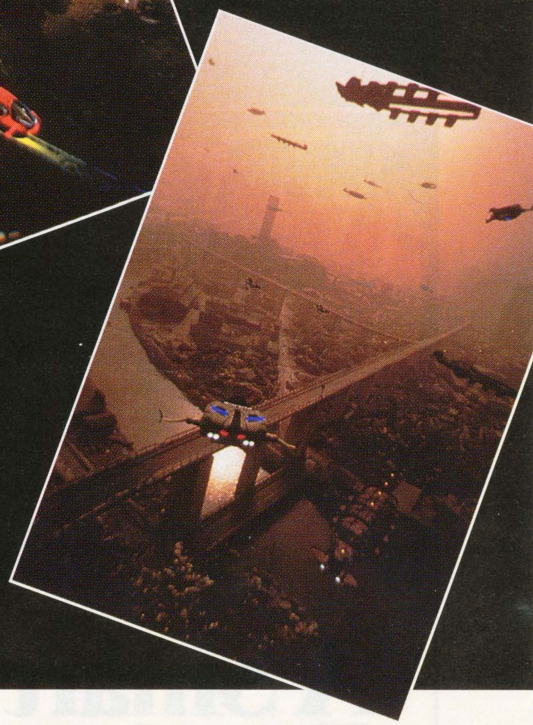
Electronic Publishing, formerly *TypeWorld,* focuses on the digital publishing and prepress markets, covering all new products, equipment, and software. Published 18 times annually in newspaper format, *EP* is the best source of information for these growing markets.

CGW & CP Buyers Guides are both single editions that list all vendors and products from their respective fields. These comprehensive guides influence all professionals involved in purchasing equipment and supplies. Gain access to the marketplace by looking into the right Buyers Guide.

PennWell GRAPHICS GROUP



Of the potential futures explored in "The Theatre of Time," the "dystopian view" (left) depicts the destructive consequences of man's inhumanity to man, while in the "utopian view" (below) hope and happiness prevail.



During the simulator ride titled "In Search of the Obelisk," a vast subterranean cavern sets the scene for a high-tech dogfight (above). At the entrance to a giant underground pyramid, participants soar through a maze of floating obelisks (right).

TIME TRAVELS

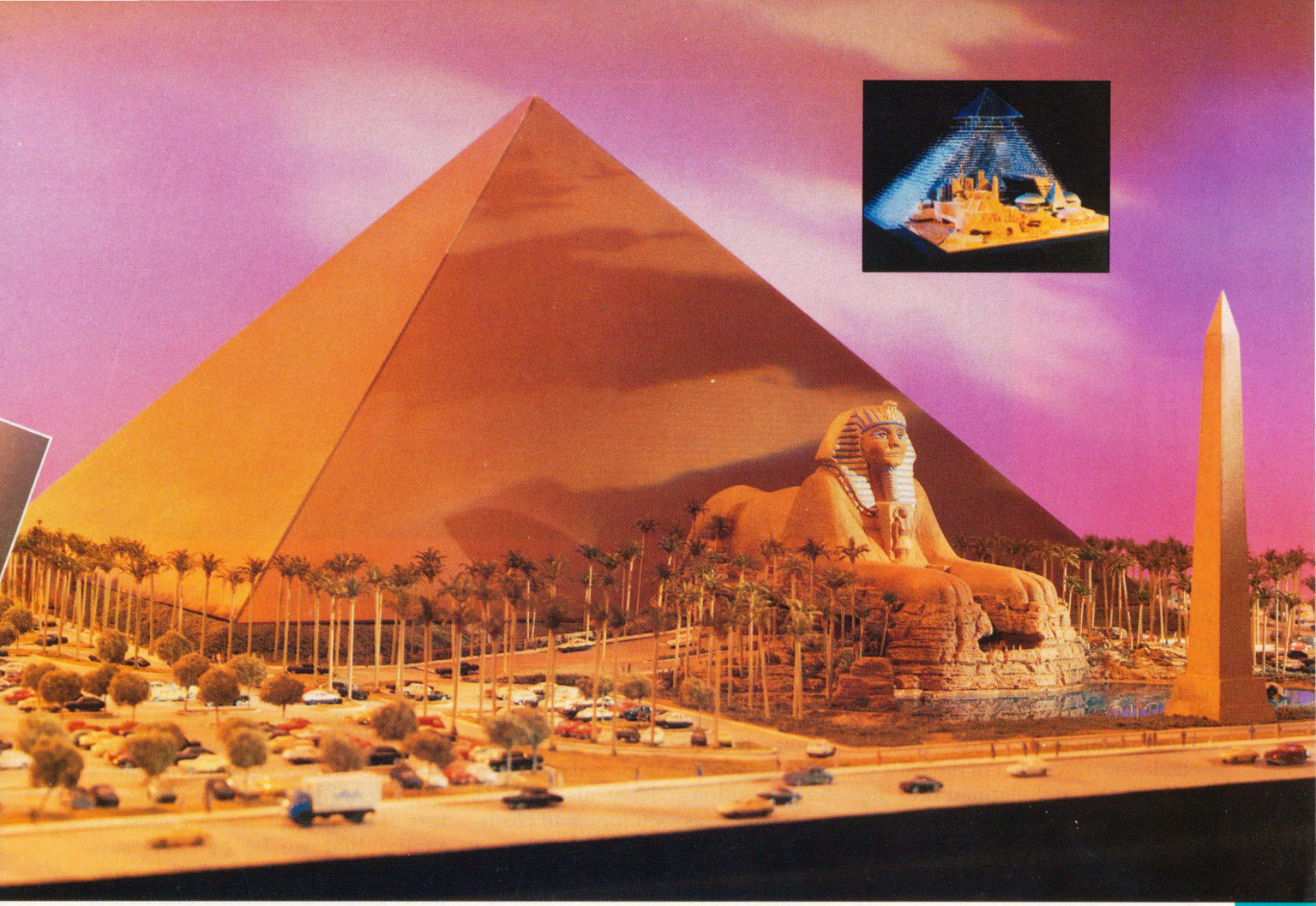
Elaborate special-effects adventures for a new Las Vegas hotel transport participants to past, present, and future worlds

With its quiet, tree-lined streets and white picket fences, the small town of Lenox in western Massachusetts has Norman Rock- well written all over it. Well, perhaps not *all* over it.

In an anything-but-flashy studio located in a sedate corner of this quintessential New England community reside the technology and technicians responsible for a powerhouse entertainment project that will soon shake, literally, the city of Las Vegas.

For the past year, renowned visual effects guru Douglas Trumbull and computer animators with the Hollywood-based Kleiser-Walczak Construction Company have been at work here producing a series of special-effects films for the new Luxor Las Vegas, a hotel and casino resort housed in a 30-story reflective pyramid complete with the River Nile flowing along its interior perimeter. Located at the southern end of the Las Vegas strip, Luxor Las Vegas, which is scheduled to open this month, represents a $375 million endeavor by its owners, Circus Circus Enterprises. With the goal of creating a family-oriented entertainment extravaganza, Circus Circus hired Trumbull to develop the state-of-the-art special-effects films. In turn, Trumbull contracted the services of Kleiser-Walczak to produce all of the computer-generated imagery.

With Trumbull's expertise in creating film effects using miniature sets and advanced photographic techniques ("2001: A Space Odyssey" and Universal Studios' "Back to the Future—The Ride" are among his credits) and Kleiser-Walczak's computer animation prowess, the collaboration spawned "The Secrets of the Luxor Pyramid," consisting of three high-impact adventures, including a motion-based simulation, a stereoscop-



A 30-story reflective pyramid, the new Luxor Las Vegas hotel/casino resort occupies 2.45 million square feet, including the world's largest atrium, 100,000 square feet of casino space, three levels of entertainment attractions, and seven themed restaurants. The computer graphics-intensive "participatory" films will play continuously in the hotel's entertainment complex.

ic film, and a large-format, high-resolution film. The trilogy depicts, respectively, past, present, and future worlds.

Each of the three episodes follows an elaborate story line conceived by Trumbull. For example, the theater housing the motion-based simulation becomes the deluxe space vehicle that "transports" the audience one mile below the Luxor to the site of an archaeological dig where a subterranean civilization has been discovered. When a valuable obelisk falls into the wrong hands, the trip escalates into a high-speed chase through a vast cavern and intricate unexplored areas.

A combination of physical and perceptual elements contributes to the ride's powerful impact. For example, participants' seats move on a hydraulically controlled platform, with the movement synchronized to the fast action on the screen. The perception of pitching, yawing, and rolling is effected through the intensity of the film itself, which was shot through a fish-eye lens and is projected onto a hemispherical screen.

In total, this segment, titled "In Search of the Obelisk," consists of four minutes of film footage, one minute of which is full-frame computer graphics. Initially, Trumbull had planned to use traditional models for all but the spacecraft. But, according to Kleiser-Walczak partner Jeff Kleiser, "Because of the scale, [Trumbull] realized the rigging cameras would have cost a fortune comparatively. So he went with computer graphics." In fact, Kleiser adds, "The whole cavern sequence was entirely computer-generated."

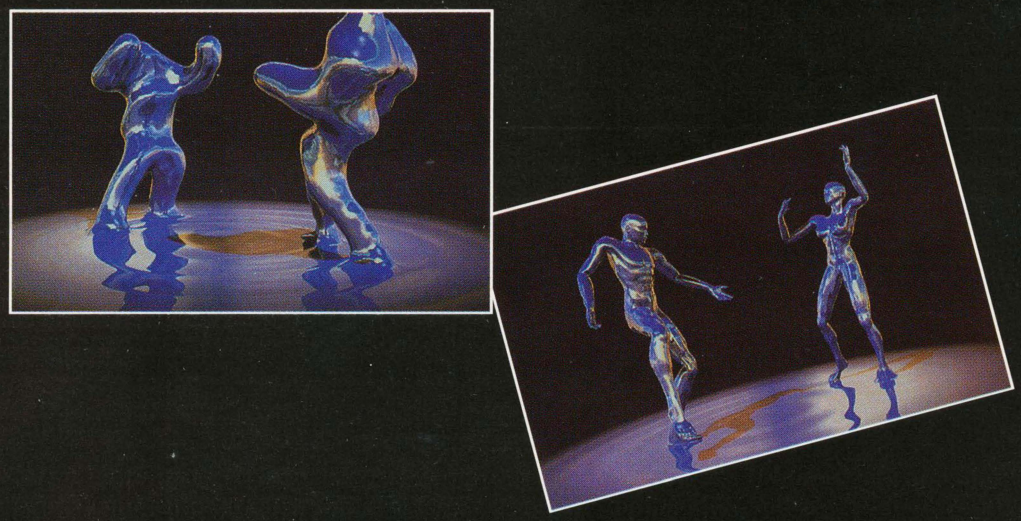
A TV talk show called "Luxor Live" sets the scene for the present-day episode. For this, the audience is asked to wear special glasses to protect their eyes because they will be viewing a total solar eclipse, live via satellite, from Egypt. In reality, the eyewear are stereoglasses that provide viewers with a 3D stereo perspective of a 2 1/2-minute dream sequence.

Meanwhile, in "The Theatre of Time," the episode set in the future, observers peer into the year 2300 through a "cosmic time machine." On a seven-story vertical projection screen, the 15-minute film—seven minutes of which are high-resolution computer imagery—depicts potential futures, ranging from a positive scene filled with "happy spaceships" to a city that has been destroyed as a result of man's inhumanity to man.

Playing a prominent role in the Luxor project are Kleiser-Walczak's trademark 3D

Diana Phillips Mahoney is senior associate editor of *Computer Graphics World.*

BY DIANA PHILLIPS MAHONEY



Originating from a smooth isosurface, "water people" frolicking on the beach become armor-clad warriors who are ultimately enveloped by a nuclear explosion. In these shots from the "Luxor Live" stereographic dream sequence, Kleiser-Walczak's trademark synthetic actors, called Synthespians, demonstrate the lifelike movements achieved by motion-capture technology.

synthetic actors, called Synthespians, which are computer models driven by human motion. To ascribe lifelike movement to the models, multiple video cameras shoot the motion of live actors onto whom numerous ping-pong balls are attached. The movement of the balls is then scanned and mapped into the computer. Using a program written by software director Frank Vitz, animators apply the captured motion to digitized clay models.

In the "Luxor Live" episode, Synthespians provide a vivid exploration of what Kleiser calls "man's warlike nature" through the fluid transformation of "a happy day at the beach" into a sort of dance of death. In this sequence, two "water people" emerge from a smooth isosurface into a sunwashed world. Seamlessly, the beings quickly assume the optical properties of glass. (Backgrounds are ray-traced through their bodies to enhance this effect.) Soon, however, evil invades their utopia, transforming them into vengeful, armor-clad warriors who are ultimately enveloped by a nuclear explosion.

In previous projects, the movement of the digital actors was limited to exactly the human motion that had been captured. But, notes Kleiser, "A major technical achievement [during the Luxor project] was the enhancement of the motion-capture system that we've been developing for quite a few years. The bodies are hierarchically defined, which means we can use the motion capture as a basis for their movement, but we can also interactively adjust, say, an arm position or a torso."

For instance, the "Theatre of Time" episode contains a scene with 500 computer-generated people to whom certain captured motions have been ascribed. For variation among the crowd, the animators were able to manipulate the characters' positions. They also varied such factors as skin tone and clothing. In the final shot, not only are the 500 "actors" moving simultaneously, but the scenes also reflect appropriate environmental changes, such as lighting and shadows. For example, airborne spacecraft—with their metallic undersides reflecting the activity below—cast shadows onto the people and structures over which they pass. Because of its complexity, this scene alone took nearly a month to complete, says Kleiser, who notes that Trumbull initially wanted the shot to include 2000 people. "That's when you have to reconcile the fun of doing stuff that's never been done before with the reality of schedule."

Technological Milestones

On the whole, the Luxor project incorporated a number of technological milestones, including the fact that all of the footage was shot at 48 frames per second, twice the frame rate as that normally used in feature films. Additionally, Trumbull's precision miniature sets (which, at the height of production, occupied nearly 1500 square feet of floor space) were shot using the largest motion-control gantry camera in the world. With its wide-angle lens, the camera "flew around the set at a pretty good clip," according to Kleiser, capturing the detail of the models and the movement of live-action characters in real time.

A fundamental accomplishment was the animation company's establishment of a full-blown computer graphics studio within Trumbull's Lenox facility. "Because of the nature of the project, it was almost essential that we be on-site," says Kleiser. "We were generating computer graphics elements that had to match the models extremely closely—to about one-one thousandth of an inch—and we were working under a tight time frame [the project was to be completed within a year]. Being in the same place [where the models were being shot] allowed daily interaction and feedback."

However, creating a remote studio from scratch presented a significant challenge. Because time was of the essence, Kleiser-Walczak didn't have the luxury of an extended honeymoon, or any honeymoon for that matter. "Basically, we moved in and installed the equipment over one weekend," says Kleiser. Critical to the success of this effort, he notes, was the assemblage of a staff of computer animation experts, garnered from such high-profile production companies as Universal Studios, Boss Film, Sidley/Wright, and Metrolight Studios. In total, Kleiser-Walczak recruited 20 professionals for its Lenox-based staff.

To meet the technical demands of what Kleiser refers to as Trumbull's "never-say-never approach" to creating mind-blowing special effects, the animation company utilized

$4 million worth of high-end computer equipment, including Indigo and Crimson graphics workstations and a series of R4000 rendering servers from Silicon Graphics (Mountain View, CA); two PVS supercomputers from IBM (White Plains, NY), each with 32 processors linked to a 21GB disk array, and access to a third PVS at IBM's Hawthorne, New York, facility; two Solitaire film recorders from Management Graphics (Manhattan Beach, CA); and high-definition monitors from Sony (Park Ridge, NJ).

Additionally, the animators relied heavily on software from Wavefront Technologies (Santa Barbara, CA) and a significant amount of custom-programs to meet some of the project's very specific needs.

Having successfully set up its high-powered studio (using what project producer Jeffrey Diamond calls a "low-key guerrilla approach"), Kleiser-Walczak immediately went into production, assigning animators to work simultaneously on each of the films.

Although the various episodes were generated independently, each followed the same basic production path. After previsualization by Trumbull's art and design staff, physical models were built that would serve as bases for the various computer graphics elements. (For example, balsa wood models of spaceships ultimately became the shiny vehicles soaring through the "future," and clay models of people provided the body structures for the Synthespians.) The models were then digitized and the animators added textures, materials, lighting, shadows, reflection, and other effects to enhance realism.

After creating each shot, the animators would test the motion and rendering on their workstations, then send video-resolution frames to a Sony videodisc recorder for client review. Once approved, the production data was sent for rendering either through the SGI R4000 servers or one of the IBM supercomputers, depending on the demands of the scene. "We found that if an image used a lot of ray tracing and was very complicated, like the dancing glass people, the PVS really streaked through that stuff," says Kleiser. On the other hand, when a scene required that a lot of elements be loaded individually—hundreds of spaceships, for example—the animators used the SGI array. This is because the Wavefront implementation available at the time limited the PVS to using one processor for loading. "It's not a very efficient use of the other processors to have them sitting around while one is loading the object," Kleiser notes.

For the scenes comprising full-frame computer graphics, the next step was to record the data on film via one of the Solitaire film recorders. When computer graphics elements were to be combined with either model photography or live action, the data was sent through the second PVS supercomputer and composited—via software written by compositing supervisor Serge Sretchinsky—with the film (scanned frames of the footage were provided by Kodak). The compositors could then preview the shots in real time on the Sony high-definition monitors and "do anything that had to be done to make the scene look right," says Kleiser, including image processing, interactive lighting, rotoscope mattes, and final color corrections to make the computer-generated elements appear color-balanced with respect to the background. The composited scenes were then recorded to film.

Unique Challenges

Throughout the production process, the animators were faced with technical challenges unique to each of the three films. For the episode depicting the past, for example, the sheer computing required to match the CGI perspective to that of the live action attained through a fish-eye lens represented "a gargantuan task," notes Kleiser. Because the focal length of a fish-eye lens changes relative to an object's proximity to the center of the lens, the animators had to simulate what would happen to the computer-generated images if they had been shot through such a lens. This required setting up three 4K-by-3K computer cameras, one each looking to the left, straight forward, and to the right. To simulate the variable focal length, pictures from the three cameras were merged into one image and run through a fish-eye conversion program written by Frank Vitz using an algorithm developed previously by Ned Greene.

"Basically, this meant that we had to render three camera views to make one frame of film and run it through this fish-eye program," says

Kleiser. "That's a huge amount of computing to get down to just one 4K-by-3K final frame, especially when we had to fill every pixel, like for the cavern sequence [60 seconds shot at 48 frames per second]."

Creating the stereoscopic film for "Luxor Live" presented its own obstacles, with the "most interesting hurdle," according to Kleiser, being the development of the tools to interactively view the 3D materials in stereo. "Normally you could look at a screen and compose [3D elements] two-dimensionally and you'd do fine, but working in stereo adds a whole other mess. You have to be able to see in 3D where you're putting objects and where objects interact with one another." For this task, Vitz developed a program that interfaced CrystalEyes LCD stereoglasses from StereoGraphics (San Rafael, CA) with the Wavefront software.

Filming the "Future"

In the "future" episode, a significant technical achievement, says Kleiser, was seamlessly integrating the CGI with the model photography, because it required matching precisely the movement of the computer camera to that of the gantry camera. "This was tricky because there are idiosyncrasies of the camera, slippage in all the belts and gears, so that the camera isn't always where it thinks it is. We had to figure out how to match the computer camera positions, which are perfect, to the real-world camera positions, which are imperfect." He notes that, on film, even a positional difference of only one-one thousandth of an inch can result in visible sliding of elements.

To compensate for inconsistencies, Kleiser-Walczak developed custom software based on physical investigations of camera positions. The time-consuming testing process involved attaching a pointer to the end of the gantry camera and moving it to a location with known coordinates. They would then survey different parts of the set to verify that the camera was where it thought it was. When the actual and perceived positions differed, says Kleiser, "We would have to compensate for that in our software, to sort of answer the question, 'Well, when the gantry thinks it's at x, y, z location, where is it really?' "

The camera idiosyncrasies provide an example of what producer Jeffrey Diamond refers to as the "research and production challenge" that defined Kleiser-Walczak's work on this project. "It was all 'learn as you go,' because [the project] included so many 'never been done befores'—the one-of-a-kind camera, the film speed, the projection lens—and because we had to go into production and create the process at the same time."

Fortunately, the staff rose to the challenge, says Kleiser, who credits a tremendous "esprit de corps" and a willingness to work nearly around the clock on many occasions as major contributing factors to the project's success. He admits, however, that the volume of work was almost overwhelming at times and suggests that if he had it to do over he would involve more people. Then again, maybe he wouldn't. "With more people and equipment, the project would probably just have grown in complexity in proportion to the added resources." *CGW*

From head to toe, we cover all the motions.

For tracking head and body motions in animation, biomedical, and virtual reality applications, *Flock of Birds*™ is the six degrees-of-freedom measurement product for you. With features that make your job easier- fast measurement rate, simultaneous tracking of up to 30 points, fastest dynamic performance when tracking multiple points, no body blocking, proven long-range operation, free interface software. And now, it's also the lowest-priced magnetic tracker.

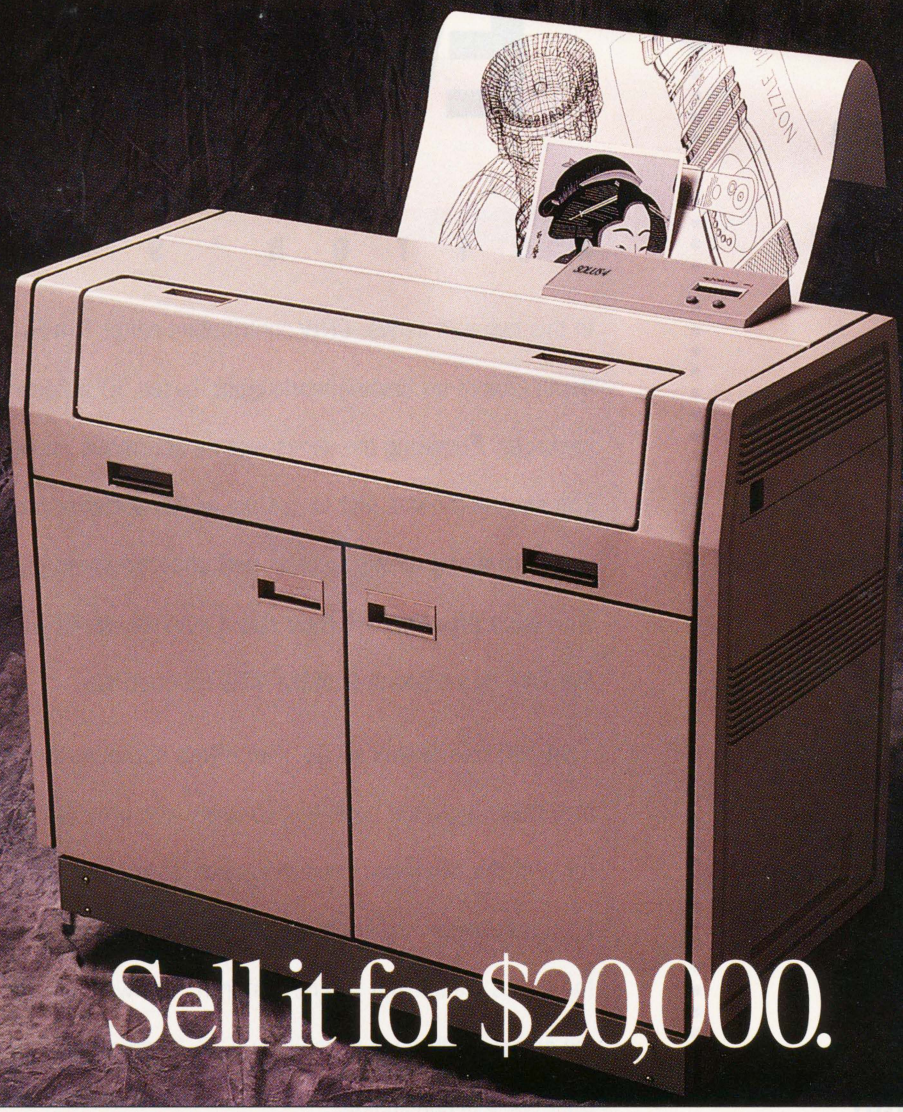
Flock of Birds, selected by industry leaders such as SOFTIMAGE, PDI, and Mr. Film for bringing human motions to their special effects characters, is the tracker to animate your next project. Call for details on our no cost evaluation program.

Ascension
Technology Corporation

P.O. Box 527, Burlington, VT 05402, TEL (802) 860-6440 FAX (802) 860-6439

CIRCLE 15 ON INFORMATION CARD

After designing a brand new $40,000, 400 dpi, A-D sized, 10 ppm, dual-roll plain paper laser plotter, we had an even better idea.



Sell it for $20,000.

You'd probably expect to pay over twice as much for a plotter with all the features of our new Solus™4.

Because until now, that's exactly what you had to do.

But thanks to a breakthrough in laser technology, our new LED plotter delivers all the features and performance of the $40,000 models – for under $20,000.

Besides which, the Solus 4 is compact, quiet and extraordinarily user-friendly. And it accepts a wide variety of data formats, ensuring compatibility with all major hardware platforms and software packages.

So contact your CalComp dealer, or call us at **800-932-1212**, ext. **908** for more information.

Because bottom line, there's one major difference between our new plotter and all the rest.

The bottom line.

We draw on your imagination.™

CalComp
A Lockheed Company

Suggested retail price $19,995, U.S. dollars. 10 ppm printing speed for A-sized plots. Nozzle plot courtesy of Autodesk, Inc.
Japanese lady plot courtesy of Micrografx. "Solus" and "We draw on your imagination" are trademarks of CalComp Inc. © 1993 CalComp Inc.

CIRCLE 16 ON INFORMATION CARD

Part One
of a two-part series

Evaluating

An in-depth comparison of those 3D graphics and animation packages that define the high-end of the computer graphics world

EDITOR'S NOTE

In this two-part series, *CGW* contributing editor Tim Forcade takes an in-depth look at six leading workstation-based 3D modeling and animation packages. Preparing the series was an enormous undertaking, as it took Tim several months just to acquire all the software programs, get them up and running on his system, and undergo some preliminary training with each program. He then spent several weeks with each package, learning the ins and outs of the different offerings.

In part one of this series, Tim offers some preliminary insights into how these high-end packages compare and provides an in-depth look at three of the offerings: PowerAnimator from Alias, Creative Environment from SoftImage, and Explore from Thomson Digital Image. In part two of the series, which will run next month, Tim will take an in-depth look at the software offerings from ElectroGIG, Vertigo, and Wavefront as well as offer his final conclusions.

Tim Forcade is a *CGW* contributing editor and president of Forcade & Associates (Lawrence, KS), a multidisciplinary design and communications firm.

BY TIM FORCADE

3D on the High End

As a graphiker who has worked with 3D since its beginnings in CAD through its emergence on PC, Macintosh, and Silicon Graphics platforms, I have attended numerous computer graphics conferences in order to study 3D visualization and animation at the high end.

Watching live demonstrations and studying stacks of photographs and demo reels, my sense of the sophistication of these programs increased. However, the details of how the actual production processes for each program compared to one another remained a mystery to me, accessible only through the patient artists and animators willing to answer my unending streams of questions.

The emergence of the Silicon Graphics Indigo, Indigo 2, and Indy workstations as well as the dropping prices of high-end software and support further motivated me to better understand these processes. It had become obvious that the extraordinary tools available from companies such as Alias, ElectroGIG, SoftImage, Thomson Digital Image, Vertigo, and Wavefront as well as the power and sophistication of the Silicon Graphics platform had become accessible to artists, animators, and designers in large and small companies alike. As a result, I resolved to get hands-on experience with each program and write an article that would begin to demystify the process of 3D graphics and animation at the high end.

As I set out on this project, I was looking to develop an understanding of the "feel" as well as the specific workings of each program. I also wanted to develop a useful means of comparing each program. I wanted an experience that would lead me to a clearer understanding of the state of applied 3D computer graphics.

I conducted my research by devoting a period of months to training, working with the programs, executing tutorials, and studying documentation. I installed each program on an SGI Iris Indigo XS24 with Z-buffer, 54MB of RAM, 1.4GB of hard-disk storage, and a Dial Box. This amount of disk space allowed all six programs to be installed simultaneously, which simplified access and facilitated program comparison. The hands-on experience was enhanced with numerous conversations with technical support people, users, and, finally, visits to each manufacturer's booth at SIGGRAPH 1993.

© Marc Pasini 1993 M.P. Productions

Animator Marc Pasini of Paris used SoftImage software to create this Airstream model. The model, which contains 1000 objects, comes from a 10-minute animation.

I assumed that this approach would allow me to come to a clear conclusion about which program was the best of the bunch. However, this has not happened. All of these programs offer advanced mechanisms for the production of professional-level 3D graphics and animation, and all offer an unprecedented quality of feedback and interaction with the 3D process. Any of these programs in the hands of a creative and facile graphiker constitutes a unique medium—a medium with character, complexity, sophistication, and potential comparable to any existing media, traditional or non-traditional.

Furthermore, I came to realize that the experienced graphiker could undermine the usefulness of any qualitative ranking or "shoot out" between these products. While it's

true that all the programs have their weaknesses, it's also true that each of the programs is so deep that for every perceived weakness there is often a viable workaround that is open to a capable user.

As you study the features on the accompanying product comparison chart, you will note an interesting mix of functions as well as an outstanding number of similarities between programs. There is no question that comparing features can be useful for judging overall capabilities. However, rating one program over another based strictly on features is as foolish as stating a preference for one photograph over another based purely on the shutter speed used. Moreover, because the vendors of these programs are locked in a perpetual features war and must adhere to a breakneck development cycle, any advantage in features that one vendor gains over another is often a temporary advantage at best. The fierce competition in this market forces a great deal of similarity between packages.

Realistic trees and plants generated with the TDI AMAP module can be used for backgrounds, within architectural visualizations, and for other situations requiring natural-looking landscapes.

Does all this imply that there are no significant differences between programs and that it makes no difference which program you purchase? Definitely not. Though there is no clear "best" program, each program does have some clear strengths and weaknesses. Where some programs offer more complete modeling functions, others offer richer command sets for animation or materials description and rendering.

Interestingly, however, these programs differ as much in the implementation of their functions as they do in the functions themselves. Therefore, close consideration of each program's user interface becomes vital to new and seasoned users alike. How a program's tools are visually coded and made accessible to the user not only impacts the initial learning curve but continues to define, and potentially limit, both productivity and creativity.

Given that the process of working with any medium is about experimentation, the graphiker must, by definition, constantly push the limits of every tool and function available. This process can be dramatically enhanced by a responsive, flexible, and predictable work environment. And even though features are regularly added to most programs, a given interface typically undergoes relatively subtle change, if any change at all.

The other thing users should realize is that most of these programs may be purchased in separate modules by function. This can result in significant savings if, for instance, your needs do not include animation, allowing you to get by with just the modeling module of a given program.

This modular approach also suggests that it might be possible to mix and match modules from different programs—say, a modeling module from one manufacturer and an animation module from another. On balance, however, this is not a good idea. Aside from the obvious expense involved with maintaining multiple programs, translating data to and from different programs can be complicated and time-consuming and may result in the loss of those characteristics that you wished to access in the first place.

In contrast, when all your modules come from a single vendor, you gain outstanding advantages in flexibility, speed, and ease of use ... particularly for the less technical user.

As a final bit of advice, let me just remind you that, as you assemble your system, be sure to take a hard, close look at the hardware requirements for each program and factor into that the type of work you intend to do with it now and in the near future. Consider the essentials, typically 24MB of RAM for faster renders, 1GB of hard-drive space to accommodate numerous project files and program swap space, and 24-bit color video for accurate preview of lighting and materials. Also consider adding a CD-ROM and DAT drives for program upgrades, backup, and increased access to textures and clip objects. By all means, avoid hobbling software this powerful with inadequate memory and hard-drive space and insufficient display color depth and speed.

ALIAS POWERANIMATOR 4.1

Alias Research Inc.
110 Richmond St. E.
Toronto, Canada M5C 1P1

CIRCLE 228 ON INFORMATION CARD

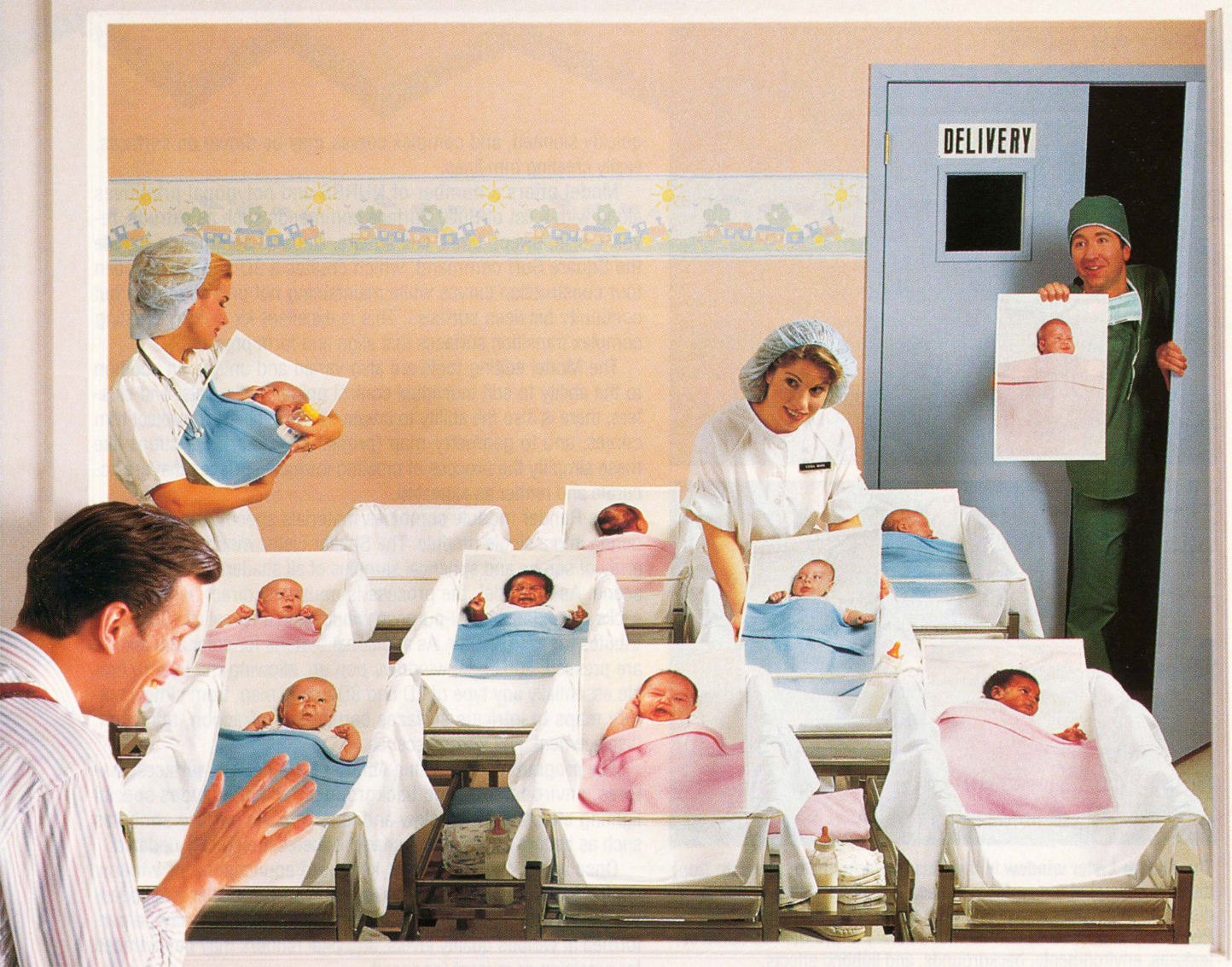
Recognized for its powerful and flexible modeler, and deservedly so, Alias PowerAnimator 4.1 demonstrates significant strengths in animation and rendering as well. Its interface, based on numerous special-purpose pop-up windows, is extremely flexible and allows the user to adapt the 3D environment to best suit an individual working style.

Program documentation is exhaustive, with numerous comprehensive tutorials, program manuals (cross-referenced and indexed), technical manuals, and a 178-minute training video. The structure of the tutorial manuals is particularly well done, with foundations and command descriptions preceding step-by-step procedures.

Interface/Structure

Following login, the user is presented with the IRIS Workspace window containing multiple Alias icons for the installed options. PowerAnimator is loaded by mouse-clicking the Alias3 icon which displays its top-level menu from which each module or function is accessed. PowerAnimator's principal modules for modeling (Model), materials management and rendering (Render), and animation (Anim) may be instantly accessed by mouse-clicking the corresponding menu entry for each. Additional modules include Paint, Scan, a video import/export module, and a number of utilities.

The Alias interface defaults to four windows but will allow any



There's only one family of color printers that gives birth to your ideas in half the time!

Mitsubishi's Dye Sublimation Digital Color Printers. Now you don't have to go through labor waiting for your prints.

In just 100 seconds, our new dye sublimation digital printers make your brilliant ideas come alive in breath-taking color. All on standard format prints–from 8 ½ x 11 to 11 x 17 full-bleed. Giving birth to multiple prints is also a breeze, because each model features a full-frame, four-color buffer.

From advertising to astrophysics, you won't find a broader line of 300 d.p.i. color printers that answer your graphic needs like Mitsubishi's. Plus, they're all PostScript compatible and operate with MS-DOS, Macintosh or UNIX platforms.

Mitsubishi's new family of digital color printers. What you can conceive, we can deliver. Call us for all the details at 1-800-PED-VIEW.

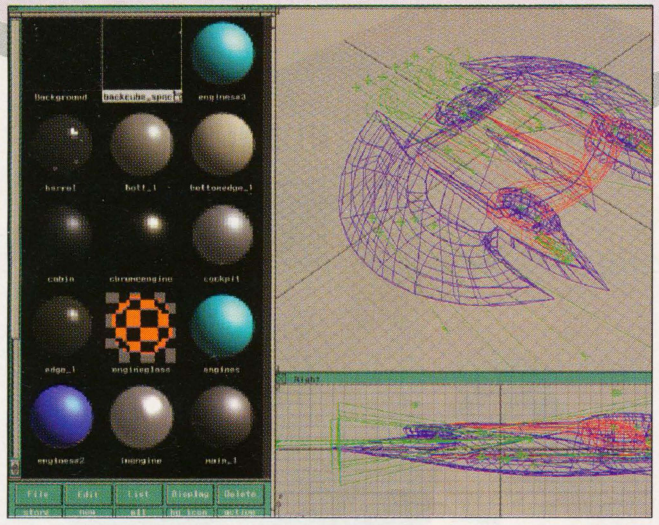
MITSUBISHI

PROFESSIONAL ELECTRONICS DIVISION

TECHNICALLY, ANYTHING IS POSSIBLE®

Macintosh is a registered trademark of Apple Computer Inc. MS-DOS is a registered trademark of Microsoft Corporation. PostScript is a registered trademark of Adobe Systems Inc. UNIX is a registered trademark of UNIX Systems Laboratories. © 1993 Mitsubishi Professional Electronics Division, 800 Cottontail Lane, Somerset, New Jersey 08873

CIRCLE 17 ON INFORMATION CARD



The Shader Lister window in the Alias PowerAnimator program (top) displays several of the surfaces in use for the space ship, which is displayed in the perspective and right views. **The Render module** in PowerAnimator (above) comes with a library of pre-defined surfaces, textures, environments, backgrounds, and lighting effects.

number of orthogonal, perspective, or Scene Block Diagram (scene hierarchy) views. Each window has a series of view control icons arranged on its title bar. These control the camera essentials such as zoom, pan, rotate, and magnify, which is particularly useful for quickly examining complex models or hierarchies.

There are numerous special-purpose windows (and windows that spawn windows) for many commonly used functions. These range from a Text Parameters window, which is used to create text objects, to Render Parameters and Deformation Control windows. Interestingly, any combination of windows that has been opened in one module is preserved in the next. This allows the user to carry essential tools to and from different program modules. Furthermore, any window may be resized, stowed, or repositioned anywhere on the screen.

All in all, the Alias interface is well organized and, for the most part, has a smooth, intuitive feel. However, the addition of keyboard equivalents, particularly for view commands and window selection, would be desirable.

Program Modules

Alias Model is a NURBS and polygonal modeler with a particularly responsive feel. This is linked to a command set that makes even complex modeling procedures seem familiar and unusually direct. For instance, object cross sections, which are drawn without regard to the number of control vertices in them, may be quickly skinned, and complex curves may be drawn on surfaces, easily creating trim lines.

Model offers a number of NURBS and polygonal primitives along with a list of Build Surface commands such as extrude, revolve, skin, swept, birail, and square. Unusual commands include the Square Surf command, which creates a 3D surface between four construction curves while maintaining not only alignment but continuity between surfaces. This is excellent for quickly creating complex transition surfaces that align and form predictably.

The Model editing tools are also varied and unique. In addition to the ability to edit individual control points, hulls, sets, and clusters, there is also the ability to create freeform fillets, to project trim curves, and to geometry-map (project geometry). Functions like these simplify the process of creating intricate surfaces that are accurate and render as expected.

The Render module combines materials specification and rendering into a single module. The Shader Lister window displays an array of square and spherical samples of all shaders for the current scene. As in Model, the process is unusually direct, with mouse clicks spawning special-purpose windows that reveal all surface attributes for each shader. As additional buttons for color and texture are pressed, additional windows pop up, allowing the user to create essentially any type of 2D and 3D image map, from simple texture maps to intricate surfaces combining refraction, reflection, displacement, and incandescence.

The program comes with a library of pre-defined surfaces, textures, environments, and backgrounds, which includes special lighting effects such as glow and lens flare. As surface attributes such as texture are changed, shader spheres are quickly updated.

Once again, the addition of keyboard equivalents for window control would go a long way to reducing screen clutter and speeding program interaction. Hardware preview renders may be performed at various quality levels, and final renders may be raytraced for precision or raycast for speed.

The Alias Anim module supports animation by keyframe, shape interpolation, deformation, and skeleton inverse kinematics. Alias' animation process can be as simple as aligning an object to an arbitrary 3D curve or as intricate as manipulating dozens of channels corresponding to numerous object translations or shader parameters. Anim does an excellent job of managing these complexities through its Action and Animation Preview windows.

The Action window combines a listing of each animation channel with a graph displaying a corresponding NURBS curve for each. From here, the user may selectively adjust the speed and quality of motion for each individual channel. The ability to randomize selected motions is particularly useful for imparting a more natural sense to transformations and shader parameters. Alternatively, the Time Editor allows manipulation of object or hierarchically level issues such as sequence start, end, and duration.

Animations may be previewed in all windows or in the special Preview window. The Preview window, in addition to providing control over playback, provides viewing optimization and Play Blast, which allows wireframe or quick rendered playback at 30 or 24 frames per second.

Conclusion

Alias' reputation for sophistication in modeling is well deserved. Alias Model is outstanding. It is exceptionally smooth and responsive and features NURBS and polygonal geometry combined with editing tools that are extremely well implemented and easy to use.

Exponent Graphics® for X

Attention UNIRAS® agX/Toolmaster users! Call now for your 50% discount.

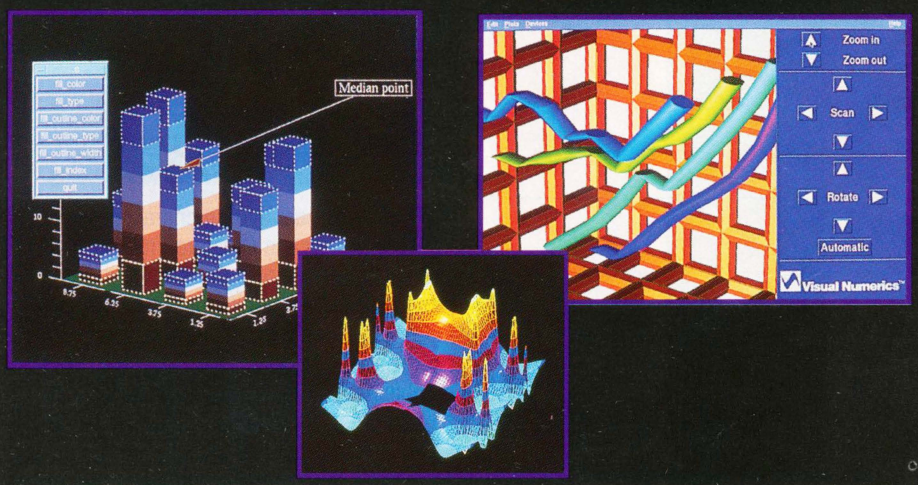
A powerful Motif® widget library for creating presentation-quality graphs from your X applications.

What sets Exponent Graphics for X apart:

One of the world's most advanced workstation graphing tools, Exponent Graphics for X provides a hierarchy of Motif™ graphing widgets for technical data presentation and analysis. It also includes a built-in GUI for quick-start prototyping and interactive data manipulation.

Exponent Graphics for X includes:

- More than 25 powerful, interactive OSF/Motif graphing widgets coupled with more than 200 X resources, which support the Xt standard and are fully compatible with with all GUI builders that support Xt.
- A complete collection of graphics from 2D scattered data contour plots to intersecting 3D surface and histogram plots.
- Full online documentation with hypertext links and copy-and-paste example programs.
- Powerful graphics attributes such as named colors, access to device fonts including X Windows and PostScript, thirty 2D and sixteen 3D pre-defined markers, nine line types, multiple light sources, and three types of shading.
- Features such as interactive pan, zoom, and rotation (using hardware acceleration where available), true hidden surfaces, multiple plot interactivity, and others.



Why you need Exponent Graphics for X

- Rapid Motif™ application development
- Quick performance
- Interactive prototyping and graph customization
- Programmer flexibility

Request your FREE Exponent Graphics for X evaluation kit today!

Fax to 713-781-9251

Or call: 1-800-364-8880 or 713-954-6785.

In Europe call 41-22-342-07-77.

Name _____

Organization _____

Street _____

City _____ Country _____

Fax ( ) _____ Phone ( ) _____

☐ HP 9000/700 ☐ IBM RS/6000 ☐ SGI ☐ DEC Alpha ☐ Open VMS ☐ OSF1 ☐ Sun SPARC ☐ Sun OS ☐ Solaris

Orders must have fax and phone numbers for processing.

AD9339

Visual Numerics™
IMSL and Precision Visuals are now one.

CIRCLE 18 ON INFORMATION CARD

Visual Numerics™
IMSL and Precision Visuals are now one.

Product Comparison Chart

COMPANY	ALIAS	SOFTIMAGE	TDI
PRODUCT NAME	Animator & Power-Animator 5.0	Creative Environment 2.65	Explore 3.02
PRICE RANGE	$7000-$45,000	$6000-$60,000	$16,900-$62,000
USER INTERFACE OPTIONS GUI, Script-editing language, SGI Dials Box, Shader-editing language, Real-time motion capture	All	G, Sh, R	All
MODELER			
GEOMETRY Polygonal Meshes, Linear Patch, Cardinal Patch, b-spline patch, NURBS Patch, Metaballs, Particle Systems	PM, LP NP, PS	All except NP	All except CP
2D PRIMITIVES Circle, Rectangle, Arc, N-gon, Linear Spline, Bezier Spline, Cardinal Spline, b-spline, NURBS	C, R, A, LS, b-s, N	All except N	All except CS
3D PRIMITIVES Face, Sphere, Cube, Cylinder, Cone, Helix, Torus, Tube, Grid, N-hedron, Clip Objects, Instance Objects, Null Objects	F, S, Cu, Cy, Co, Tu, CO, IO	All except H, IO	All except NO
OPERATIONS Move, Rotate, Scale, Stretch, Mirror, Copy, Autotrace, Extrude, Extract Curve, Bevel, Chamfer, Fillet, Surface Blend, Revolve, Randomize, Cross-Sectional Model, Cut, Project Curve on Surface, Draw on Surface, Geometry Map	All except Ch	All except Ch	All
EDITING BY Vertex, Face, Control Vertex, Object, Group, Cluster, Hierarchy	All except V	All	All
BOOLEAN 2D, 3D, Union, Intersection, Difference	All	All	All
RENDERER			
SHADING TYPES Wireframe, Flat, Gouraud, Lambert, Phong, Blinn, Raytrace, Radiosity, Self Illuminated, Shadow Object	All except Rad	All except Rad, SI	All except B, Rad
MAPPING Image, Reflection, Environment, Bump, Displacement, Opacity, Luminance, Shininess, Specular, Procedural	All	All	All except D
RENDER OPTIONS Object, Window, Frame, Field, Segment	All except Fr	All	All except S
EFFECTS Motion Blur, Fog, Smoke, Water, Lens Flare, Clouds, Rain, Explosions, Depth Cue, Depth of Focus, Image Compositing	All except IC	All	All except LF
LIGHTING			
TYPES Ambiant, Spotlights, Pointlights, Area Lights, Distant Lights, Linear Lights	All	All	All
VARIABLES Hue, Luminance, Saturation, Falloff, Positions, Target, Exclude-Object List, Cone Angle, Shadow, Project Image	All	All	All

Even particularly complex modeling operations involving intricate surfaces are carried out quickly and with excellent feedback.

PowerAnimator's Render and Anim modules offer comparable flexibility and ease of use through their multiple pop-up windows. For instance, Render's Shader Lister window is an exceptional solution to working with the intricacies of image mapping and surface parameters.

Although program interaction could be improved with the addition of keyboard equivalents, the interface remains remarkably direct and intuitive. Moreover, its extensive documentation, tutorials, and training video combine to speed learning and provide an excellent learning resource.

THE SOFTIMAGE CREATIVE ENVIRONMENT 2.65

SoftImage
3510, boul. St-Laurent, Suite 500
Montreal, Quebec
Canada H2X 2V2
CIRCLE 229 ON INFORMATION CARD

The most outstanding characteristic of the SoftImage Creative Environment is the depth of animation functions provided by the combination of its Motion, Actor, and Character modules coupled with SoftImage's elegant user interface. This combination supports not only sophisticated and precise keyframe animation but also advanced functions such as wind, flock animation, and collision simulations, all with complete access and consistent control through its user interface.

The SoftImage documentation includes program foundations, command descriptions, procedures, and illustrated tutorials, which are comprehensive. Though not essential, additional tutorials as well as more illustrations to accompany selected program procedures would be welcome.

Interface/Structure

SoftImage consists of six modules for modeling (Model), animation (Motion), dynamics (Actor), character animation (Character), materials editing and rendering (Matter), and display and utilities (Tools). All these modules share a consistent user interface. Switching instantly between modules is as simple as mouse-clicking on

the desired module in the title bar or using a keyboard equivalent.

Essential program functions such as object transformations, loading primitives, camera and lighting controls, and basic animation functions are available from all modules. This saves time, minimizes distractions, and generally enhances the work process. The mouse is the primary method of program control. The current state of each mouse button, along with program prompts, is displayed at the bottom of the screen. Keyboard alternatives for view commands and geometric transformations enhance program interaction in all modules.

All program functions (menu cells) are stacked vertically on either side of the viewing area. Selected menu buttons reveal additional options or dialog boxes, many of which stay on screen, speeding multiple revisions of material qualities or lighting. Program modules display up to four views of the current scene. Any view may be quickly changed to an orthogonal, perspective, or schematic, which displays the current scene's hierarchical structure. Furthermore, any view may also display a DopeSheet that lists blank frames and keyframes and allows the user a useful alternative means of visualizing and editing motion sequences.

Program Modules

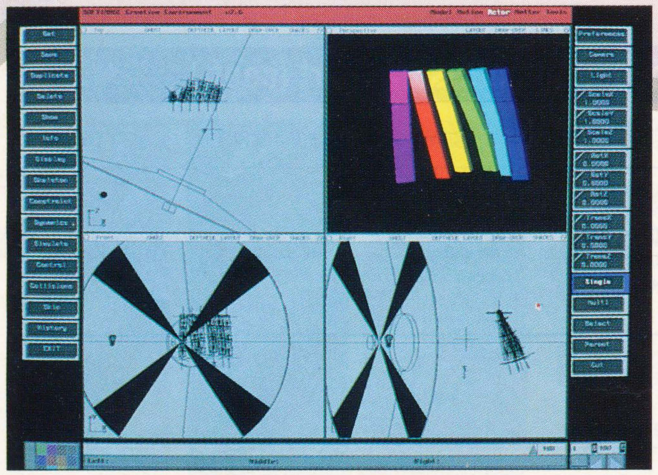
The Model module provides the ability to create detailed models using a variety of splines, patches, metaballs, and polygonal entities. Splines may be revolved, extruded, or skinned and the results merged and zipped together to form complex objects. Model's editing tools are numerous and include spline extraction and deformation. Proportional or weighted point and cluster editing offer a degree of control over B-spline geometry that makes the lack of NURBS less sorely missed. A particularly useful editing form is the lattice. This is a user-defined 3D volume of points that may be used to reshape patch or polygonal geometry.

Matter combines materials specification, mapping, and rendering into a single module. It supports local and global 2D and 3D image mapping, alpha channel masking, and mixing of relative levels of texture, bump, reflection, and transparency mapping. Animations and single frames may be hardware-rendered or rendered to disk using wireframe, hidden-line depth cue, or raytracing. Although it lacks some of the intricacies of other materials editors such

Product Comparison Chart (cont.)

COMPANY	ALIAS	SOFTIMAGE	TDI
CAMERAS Multiple Cameras, Track, Dolly, Tilt, Pan, Zoom, Area Zoom, Focal Length, Depth of Field, Aperture, Perspective Correction	All except PC	All except PC	Tr, Ti, P, Z, FL, A
ANIMATION			
METHOD Keyframe, Skeletal, Inverse Kinematic	All	All	All
OBJECT ATTRIBUTES Color Transparency, Self Illumination, Shininess	All	All	All
ENTITY Vertex, Control Point, Face, Cluster, Object, Instance Object, Null Object, Group, Particle System	All except V	All except IO	V, F, C, O, G, PS
FUNCTION Rotate, Translate, Scale, Stretch, Deform	All	All	All
MAPPING 2D, 3D, Displacement	All	All	2D, 3D
LIGHTS Hue, Luminance, Saturation, Position, Target, Cone Angle, Falloff	All	All	All
CAMERAS Track, Dolly, Tilt, Pan, Zoom, Focal Length, Depth of Field, Aperture, Perspective Correction	All except PC	All except DF	Tr, Ti, P, Z, FL, A
SHADOWS Color, Density, Falloff	All	All	All
KINEMATICS/BALLISTICS Move, Scale, Randomize, Move Segment, Copy Segment, Bank Segment, Align to Curve, Acceleration, Deceleration, Cycle Segment, Oscillate Segment	All	All	All
DYNAMICS Gravity, Mass, Density, Elasticity, Friction, Wind, Fan, Turbulence, Collision	All	All except T	G, M, D, E,W, C
DEFORMATION BY Vertex, Control Point, Spline, Patch, Cluster, Lattice, Effector	All except V	All	All except L, E
EDITING BY 3D curve, Function Curve, Interval Graph	All	All except 3D	All
ALPHA CHANNEL/VARIABLE ASPECT RATIO?	Yes	Yes	Yes
SUPPORT Print Tutorial, Video Tutorial, On-line help, BBS, Maintenance Charge	All except B	All except O	PT, MC

This chart breaks down features into various categories and shows which ones are supported by the different software packages. Because the chart was completed by the vendors themselves, it does not indicate the extent to which any given feature is supported by a given package. This means that, in some cases, one vendor might offer push-button support for a given feature, while another vendor might only support the feature as a work-around. Note also that this chart rates the most recent versions of the various products, which, in some cases, are slightly newer than the versions that were available to author Tim Forcade at the time he was testing the packages.



This view, from the Actor module in SoftImage's Creative Environment program (top), shows multiple views of a wind simulation, where wind speed and direction are used to animate a series of color bars.
This still from an animation entitled *Mandarina Catch* (above) was created by Menfond Electronic Art using SoftImage software.

as a shader language, Matter's tools are well adapted to the process and capable of producing complex and striking imagery.

The animation process in SoftImage is distributed over three modules—Motion, Character, and Actor—that work together to provide forward and inverse kinematics, skeletal animation, and dynamics functions of outstanding variety and sophistication. Essentially any geometric form, surface attribute, or camera or lighting variable may be easily and precisely animated.

Motion, SoftImage's keyframe animation module, supports editing by function curve or interval for each animation variable. Function curves are used to represent all animated attributes, and Motion's function curve editing tools provide excellent control over keyframes, motion paths, and motion segments. Motion's expanded list of constraint functions coupled with the ability to activate and deactivate them for specific sequences is extremely useful for creating motion that is both exact and realistic looking. It also accepts input from multiple external devices. Up to 256 channels may be input for real-time capture of motion or audio data. This results in raw function curves that may be mapped to animation parameters and further adjusted to achieve the desired motion.

Motion also provides Wave and Flock animation through its Effects menu. Wave is used to create animated circular, planar, and spherical wave functions for attachment to scene objects, causing them to ripple or sway. Flock animation consists of a variable particle system where source and destination 3D meshes are used to define the motion properties and massing of multiple copies of a user-specified object.

Character is a new module designed to speed the process of creating character animation. Its symmetry and propagation controls allow the user to manage multiple cyclic sequences that may be reflected bidirectionally across an object. The Actor module further frees the animator from the tedium often associated with producing complex sequences. Parameters such as gravity, collision, or wind as well as physical properties such as density and elasticity may be specified before running a simulation, which automatically generates the motion paths for the scene objects.

The Tools module combines utility programs for file and project management with a still-frame and flipbook viewer, an autotracer, a basic compositor, and scanner access. Additional utilities include import and export of numerous bitmap and geometry file formats, output to film recorders, and record/frame grab using an Abekas video recorder.

Conclusion

SoftImage 2.65 is very much an animator's program, providing one of the most advanced and complete command sets for animation available. This includes not only numerous ways to apply motion but, more importantly, numerous ways to precisely refine it.

In addition, its interface exhibits a remarkable mix of organization and responsiveness. Even esoteric functions are accessible. This goes a long way in assisting the graphiker in the understanding and use of such diverse animation tools.

Its modeler furnishes a selection of spline and polygonal geometry along with unique editing tools that are well adapted to most modeling tasks. Rendering and materials management, though lacking refinements such as a custom shader language, are nonetheless capable and easy to use.

TDI EXPLORE 3.0.1

Thomson Digital Image (TDI)
29 Rue Ganneron, Paris, France 75018

CIRCLE 230 ON INFORMATION CARD

Although recently acquired by Wavefront Technologies, Thomson Digital Image continues to enhance Explore and offers it as a stand-alone product in Explore 3.0.2, which will be shipping by the time this article is published.

Explore's most outstanding attributes lie in its modeler, 3Design, which offers sophisticated NURBS and polygonal modeling, and in IPR (Interactive Photorealistic Rendering), a unique application that allows interactive adjustments to object materials and lighting to be instantly viewed using selected scene views. Furthermore, it features its own custom surface-description language, which expands IPR's capabilities even further, thus providing exhaustive control over all surface material attributes.

Overall, TDI Explore is very well documented with extensive tutorials, illustrations, and step-by-step procedures as well as explanations for most of its functions. In addition, TDI's *Tips and Tricks*

6TH ANNUAL Government Publishers Seminar

Washington, DC • November 16, 1993 • 8:00 am to 4:00 pm

Learn about publishing as it applies to government applications, technologies, and management.

Government is still the largest publisher of them all. Even with budget cuts and rampant technological change, resourceful Federal professionals turn out hundreds of thousands of pages of information. The OTA report "Informing the Nation" provided some insights into possible directions, but it is yet to be appreciated or implemented. The problems with GPO continue and every department agency and branch seem to be going in a different direction.

Purpose:

Frank Romano, editor-in-chief of *Electronic Publishing/TypeWorld* and RIT professor of graphic arts, presents a unique blend of consultant, vendor and user perspectives enabling you to maximize the information you gain in a minimum amount of time. There will not be sales pitches disguised as presentations and attendance will be limited to optimize audience and speaker interaction.

Who Should Attend:

The 6th Annual Government Publishers Seminar will help to bring government publishing specialists together to share information and review publishing alternatives. As desktop publishing use grows, with stronger links to office automation, we will be forced to re-evaluate systems approaches.

This is your primary opportunity to network with your peers and focus on the latest government publishing technologies that can save you time and money.

Refund Policy: Registrants who fail to attend without notifying the Registrar are liable for the entire fee. Substitutions are permissible at any time. 100% refund if registrant cancels 15 working days prior to the event, 25% cancellation fee incurred thereafter.

Program Outline:

- Overview of governmental publishing activity
- Technological forces that affect publishing
- Congress interest in information dissemination
- The future role of GPO
- Electronic dissemination alternatives
- Art and graphics issues – where do you go from here?
- The evolution that got us to where we are
- The database issue and beyond
- Implications and possible courses
- Is desktop publishing the answer?
- PC, mini, graphic systems comparisons
- IBM PC/PS vs Macintosh vs what?
- DOS/Windows vs OS2 vs UNIX vs what?
- PCL vs PostScript vs Other PDLs
- Organizational, personnel issues

Seminar Fee and Team Discounts

The 6th Annual Government Publishers Seminar fee is $295, which includes your registration, handouts, question and answer period, breaks and lunch. Send three or more representatives, and deduct 10% off the program fee for each representative.

☎ Call, ✉ Mail, or 🖷 Fax in your registration today!

Tel: 508-392-2187
Fax: 508-692-7806

GOVERNMENT PUBLISHERS SEMINAR REGISTRATION FORM

Name: _____

Title: _____

Organization/Division: _____

_____

Street: _____

City: _____ State: _____ ZIP: _____

Phone: _____ Fax: _____

❑ PO Number _____ ❑ Check Enclosed

❑ American Express ❑ VISA ❑ MasterCard

Credit Card No. : _____ Expires: _____

Signature _____ Date: _____

Mail to: *Electronic Publishing*'s
6th Government Publishers Seminar
One Technology Park Drive
P.O. Box 987, Westford, MA 01886
ATTN: Barrie Evans

Registrations will be accepted in the order received.

Checks may be made payable to *Electronic Publishing*'s 6th Government Publishers Seminar.

Sponsored by: ELECTRONIC PUBLISHING
And TypeWorld A PennWell Publication

The IPR module in TDI's Explore program features interactive editing of such object and lighting attributes as texture, reflection, and shadow. Changes made to sliders in the tuning window are instantly updated in the image window.

newsletter provides regular explanations of such esoteric procedures as how to produce water caustics effects or how to environment-map bump-mapped objects.

Interface/Structure

You can load TDI's Explore program, which displays 10 icons arranged along the top of the screen, by typing "explore" and a current working project name from within a shell window. Each icon corresponds to a special-purpose module for modeling (3Design), texture mapping (Mapper), animation (Anim), materials editing (IPR Interactive Photorealistic Renderer), displaying animation sequences and still images (Display), and rendering (Render). Additional icons provide access to project management tools and such optional modules as Paint, Dynamics, and Particle.

Explore's structure, which consists of stand-alone modules, though well adapted to a systematic approach, strictly compartmentalizes the animation process. For instance, though the user may view a hardware render of the current scene in any window from any interactive module (such as 3Design, Mapper, or Anim), there is no provision for either preview rendering or final rendering of the scene from within these modules. To produce a render, the user must save the script from the current interactive module, invoke the Render module to produce an image, and then invoke the Display module to view the result. In spite of this, Explore is responsive, modules load quickly, multiple modules may be loaded and executed simultaneously, and model and animation files work seamlessly with all modules.

Explore supports multiple orthogonal or perspective viewports, with SGI's three-button mouse as the principal method of program control. Menus pop up with a right or left mouse click over any view to provide all program functions. The addition of program prompts, especially for complex operations, would be welcome.

The interface very effectively exploits user input from both the Dial Box from Silicon Graphics as well as from a list of keyboard shortcuts to its command set. The Dial Box option consists of a small box that provides an array of eight "volume" controls or dials to which object variables such as translation may be mapped. The process of using Explore is distinguished by the interaction between user, mouse, keyboard, and the Dial Box. This interaction is desirable because of the increased precision and flexibility as well as the enhanced user feedback it provides.

Program Modules

The TDI modeler, 3Design, offers a range of 2D and 3D primitives as well as sophisticated NURBS and polygonal modeling. 3Design's tools constitute a modeler of excellent functionality. Curves may be offset, arrayed, joined, cut, or projected onto an existing object or surface or extracted from an existing object. Furthermore, they may be extruded, lofted, revolved, or swept along multiple paths, forming 3D surfaces. Editing tools are equally complete and provide a useful mix of tools to shape, cut, subdivide, join, attach, and group both NURBS and polygonal geometry.

Models previously saved individually or as groups are then loaded into the Anim module where all interactive motion scripting, lighting, and the camera are created and modified. Anim allows animation along a curve, shape interpolation, shape deformation, and skeletal animation. Animation is accomplished using curves that are subdivided into one or more components, one for each trajectory. Function keys, which pop up the camera view, graphs window, and hierarchy window, speed motion-path editing and enhance feedback. This combination provides precise control over simple motion such as that of an object's scale or rotation as well as over complex motion such as the motion of dozens of animated surface color and texture attributes.

Motion scripts created in Anim may be loaded into the Mapper application. Here the user combines various paint, rendered frames, and scanned images to create image maps for texture, bump, or transparency mapping. These are applied to each object using projection methods such as planar, spherical, or cylindrical projection. Mapper allows the interactive preview of projection type and map position, which is displayed on each object's geometry. Additional control is provided for a number of output channels, tiling, and masking.

Specially rendered animation frames loaded into the IPR module may be viewed and interactively edited to modify all scene materials, textures, and lighting. Simply mouse-clicking over the desired material brings up a detailed list of all material attributes for that object. When any attribute is changed, the object is instantly updated to reflect the change. This includes reflection, refraction, and shadow qualities. IPR also provides multiple libraries of pre-defined materials (many with animated attributes) and a playback device for preview of animated textures. Finished IPR frames may then be raytraced to produce finished animations or still frames.

IPR is clearly Explore's most outstanding and unique module. It dramatically speeds and enhances materials and lighting design by minimizing the necessity of rendering and re-rendering 3D previews to determine specific scene qualities.

Conclusion

TDI Explore 3.0.1 is clearly aimed at the power user, one who is well acquainted with both the Unix operating system and TDI's strict process flow. Explore's excellent modeler, outstanding Interactive Photorealistic Render module, and render and motion scripting combine to provide a program of extraordinary depth.

Expanded system prompts, particularly for complex operations, would be a welcome enhancement, as would access to preview and final rendering from within the Model, Anim, and Mapper modules. However, Explore's use of the SGI Dial Box and its extensive use of function keys and keyboard equivalents do provide more than adequate feedback in addition to precise control of its interactive processes. *CGW*

Try Silicon Graphics' 3D library on Sun, free

Call today for your evaluation copy of PX/IRIS GL, and try the 3D library that will get your graphics applications performing to their full potential on Sun SPARCstations - for free.

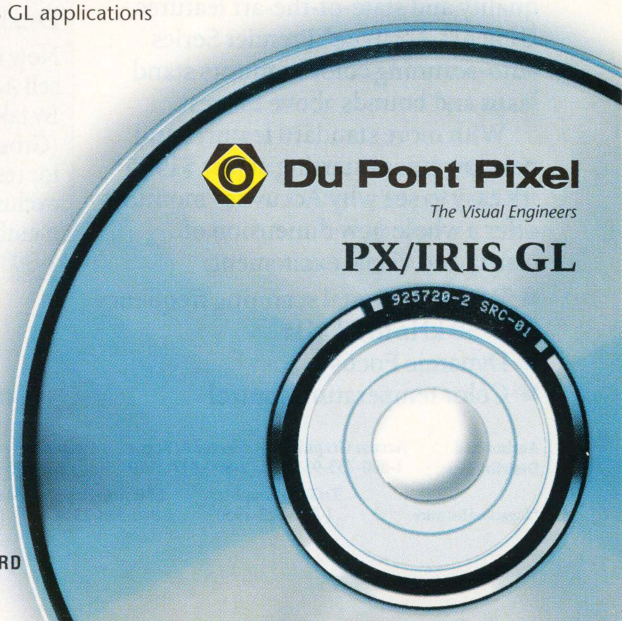
For SPARC developers, PX/IRIS GL adds a new dimension to 3D applications, bringing you the same superior performance and functionality previously only available to Silicon Graphics users. With a 500% increase in performance compared to XGL, and richer functionality, PX/IRIS GL is the library of choice for serious 3D graphics developers.

Existing IRIS GL applications can be ported to Sun, quickly and easily. Full IRIS GL 4.0 compatibility, including GL windows, font manager, pop-up menus, X integration and overlays, is enabling IRIS GL applications to be shipped on SPARC - today.

Call 800-542-1484 to get your free evaluation CD.

Your CD comes complete with PX/IRIS Explorer, the world class visualization and application building tool - all part of Du Pont Pixel's continued commitment to bring Silicon Graphics class visual processing to SPARC with IRIS GL, IRIS Explorer, IRIS Inventor and high performance GL Engines.

Also available on tape.



Du Pont Pixel

The Visual Engineers

2010 N First St, Suite 403, San Jose, CA 95131• Phone (408) 436 3455• Fax (408) 436 3458
Europe: Phone +44(0)784 470555, Fax +44 (0)784 470699,
Japan: +813 5421 1361, Fax + 813 5421 1362

All trade marks acknowledged

CIRCLE 20 ON INFORMATION CARD

INCREDIBLE PERFORMANCE

WITH A SENSATIONAL PRICE!

Only Hitachi's Accuvue® Premier Series monitors deliver *both*.

When it comes to outstanding picture quality and state-of-the-art features, Hitachi's Accuvue® Premier Series auto-scanning color monitors stand leaps and bounds above the rest.

With more standard features and new low prices starting at just $1995*, it's easy to see why Accuvue® monitors offer a whole new dimension of clarity and visual excitement:

- Wide horizontal scanning frequency — 30 kHz to 82 kHz
- Dynamic Focus
- Color temperature control
- Choice of models: 20″ (PS-20); 21″ (PS-21, PS-21A, PS-21AM)
- Auto-scanning 640 × 480 (VGA) through 1600 × 1280
- Front panel microprocessor-based controls
- INVAR shadow mask
- Magnetic field MPR-II compliance standard (Electric field optional)

Exclusive Hitachi Dealer Program!

Now it's easier than ever to sell Accuvue Premier Series monitors. By taking advantage of Hitachi's GOLD (Group of Leading Dealers) program for resellers, you'll have access to exclusive benefits offered only to members. Call Hitachi today for details: 1-800-225-1370.

Take a leap with the best monitor, and the best value for the money. Call the Hitachi distributor nearest you or 1-800-225-1370 today for more information.

HITACHI®
Hitachi America, Ltd.
Office Automation Systems Division

Authorized Distributors:

Access Graphics 1-800-733-9333	Ahearn & Soper 1-800-447-3929	Graphics Technologies, Inc. 1-800-999-9382	Ingram Micro 1-800-456-8000	International Computer Graphics 1-800-659-4244	MICROSOUTH 1-800-476-2223	
TriTech Graphics 1-800-323-1950	EMJ America 1-800-548-2319	Marshall Industries 1-800-522-0084	Information & Graphics Systems 1-303-449-1110	Hitachi (Canadian), Ltd. 1-416-826-4100		

*Suggested list price.

CMP CHANNEL ADVOCATE

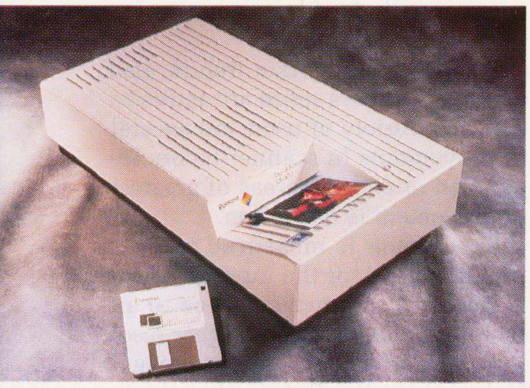
CIRCLE 21 ON INFORMATION CARD

SCANNING IN A COLORFUL WORLD

For productivity and quality at a reasonable cost, today's color flatbed and film scanners are right on target

BY KRISTY M. HOLCH

Remember five or so years ago, when few people knew what a scanner was and even fewer actually owned one? Well today, most folks know what a scanner is used for. However, for those who are planning to purchase a color flatbed or film scanner, the two types of scanners most popular among computer graphics professionals, it still can be difficult to get a handle on this fast-paced market and to truly understand the myriad of features available in today's product offerings.



This desktop photo scanner from Polaroid can capture and digitize 24-bit color photos of up to 500dpi resolution in as little as three seconds.

Scanners have come a long way since 1988, when Hewlett-Packard, Apple Computer, and Microtek first called attention to the market with low-cost flatbed devices. Back then, flatbed scanners weren't accessible to the masses due to their high cost, their limited capability, and the lack of software applications supporting them. Instead, they were used almost exclusively for specialized applications by professional publishers, graphic artists, architects, and others who had a compelling need to get graphics or text into a computer. Although handheld scanners were more accessible to users in terms of price, they presented even greater limitations than their flatbed cousins. (For more on these devices, see "Handheld Options".)

Luckily, this situation has changed dramatically. The scanner market is undergoing a rapid evolution, and several factors are converging to make scanning a must-have technology for today's graphics professional.

For one, continuing price reductions combined with performance improvements are making scanners accessible to even one-man shops. This is true for all segments of the scanning market, including flatbed and film devices. For $800, you can buy a high-quality 24-bit, 300-by-600dpi flatbed scanner that comes bundled with popular image-manipulation software; for $1600, you can buy a 35mm slide scanner. Such price performance was unheard of a few years ago.

Designed to bring negative and positive film images into video or onto a desktop computer is RasterOps' Expresso personal slide scanner.

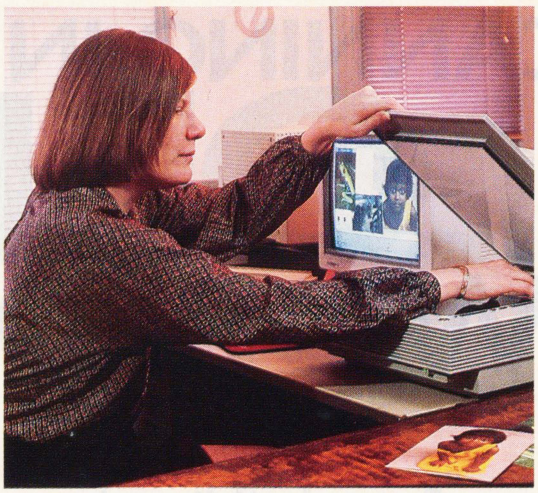
Another important improvement has been made in the variety and sophistication of scanning application software. Optical character recognition (OCR) software has improved substantially in accuracy, speed, and ease of use, giving users an efficient alternative to retyping copy. Image-manipulation programs have become both sophisticated and simplified, satisfying the needs of professional graphic artists and novice desktop publishers. New color management technology has emerged

Kristy M. Holch is director of Scanning Market Strategies at the consultancy BIS Strategic Decisions (Norwell, MA).

that works closely with scanners, application software, and the user's computer to guarantee consistent color from the scan-to-output path. And most popular page-layout programs, such as PageMaker from Aldus (Seattle), for instance, are adding features to accommodate direct input of scanned color images.

We've also seen dramatic changes in the equipment infrastructure used in computer graphics applications. High-resolution color displays, graphics cards, faster and more powerful computers, lower memory costs, and robust color output devices mean that an increasing number of users are demanding high-quality color input devices. This trend shall surely continue as color images pervade nearly every aspect of computing.

The emergence of several standards is also clearing the air for users, making brand selection much easier because more products are compatible with each other. For instance, the TWAIN application program interface (API) is a relatively new standard being adopted by most scanning hardware and software vendors, and even by some mainstream software vendors. The TWAIN API aims to provide a seamless link between compatible products, meaning any TWAIN-compatible software program will drive any TWAIN-compatible scanner. Other standards involve file formats (such as TIFF or Kodak Photo CD), compression, color management (such as Apple's ColorSync), and interfaces (such as SCSI).



Offering 24-bit, single-pass color scanning, the ScanJet IIc flatbed scanner from Hewlett-Packard includes a printer-calibration feature, spot-color extraction, and OCR capabilities.

Finally, as scanning quality has improved, the number of applications in which people use scanners has increased. Initially, scanners were primarily used in graphic arts applications; now they fill many different needs in all kinds of environments, from publishing to corporate, medical, scientific, real estate, and engineering. Scanners are used to input text, engineering drawings, photos, X-rays, slides, line art, and other types of originals that must be transferred from hard copy into the electronic realm. Not surprisingly, small businesses actually make up the bulk of scanner users; they use the devices to produce professional-looking materials for a nominal investment in basic scanning equipment.

All of these factors add up to a rapidly growing market for color desktop and film scanners, a market which the consultancy BIS Strategic Decisions (Norwell, MA) forecasts will grow 39 percent annually for color flatbed scanners and 33 percent annually for film scanners over the next five years.

Besides these market trends, also making scanners more attractive to a greater variety of users are several improvements in scanner technology. And one of the areas of greatest improvement is resolution.

Resolution is measured in dots per inch (dpi), or the number of data points a scanner samples in an inch-long line. But does higher resolution mean a better-quality image? Not necessarily. Before choosing a scanner, potential purchasers must be alert to the pitfalls and benefits of high resolutions.

One of the benefits is that higher resolutions capture the truest detail from the original image. This is most noticeable in line art, small images, and highly detailed images. One of the pitfalls is that scanning in high resolutions is time-consuming, because the scanner, interface, cabling, and computer system have so much more data to deal with. All of this extra data is not only expensive, it can also overload a system.

Potential users should also be aware of the difference between true versus interpolated resolution. The

HANDHELD OPTIONS

For inexpensive image input, nothing beats a handheld scanner. Generally small (scanning only 4 inches in width), handhelds have unique advantages over flatbeds. Because they are hand-propelled, they can be used on practically any surface—imagine trying to use a flatbed to scan the pattern in your wallpaper for a background, or trying to flatten a thick encyclopedia under a scanner lid to capture the dinosaur graphic running across the gutter. In addition, their small size makes them convenient for capturing small images quickly, and as a bonus, they don't take up precious desk space.

Handheld scanner vendors have worked hard to surmount the shortcomings inherent to these low-cost devices. One is scan area. Most handhelds come with image-editing software that can stitch scanned strips of the image together to complete an image of unlimited size. Another problem area is image quality—because users move the scanner themselves, it's difficult to avoid skewing or stretching the image. New plastic scan guides are available that hold the image in place while the scanner, snapped into a track, is pulled in a straight line. Microtek recently introduced a motorized color handheld that actually walks itself across the image, without the guidance of a human hand.

Today's handhelds offer most of the image functionality of flatbed scanners, with only a little loss of convenience and image quality. Vendors such as KYE, Logitech, Mustek, and Nisca offer color handhelds ranging in price from $350 to $695. Caere targets the office market with its handheld, which comes with integrated OCR and fax software. The inherent portability of handheld scanners is also being tapped by vendors: Recently, Logitech, Mustek, Nisca, and Thunderware have introduced models that plug into the parallel port of laptop PCs, making them convenient for on-the-road image capture. Nisca's device can even scan a full page in one pass, either in motorized handheld mode or as a sheet-fed.

Many users find that a handheld scanner makes the perfect starter kit before jumping full-force into choosing a flatbed scanner. Others find that handhelds make a good supplement to desktop scanners in production environments, where the primary scanner is often tied up. Either way, handheld scanners are worth considering for their unique portability, size, and flexibility.—*KMH*

If your color printer isn't a SmartJet,™ it must be one of these.

The SmartJet from IRIS Graphics. The PostScript®-compatible color printer that not only makes your output look its best, it makes other printers look like kid stuff.

For one thing, the SmartJet produces images with dazzling, vibrant colors. It offers pinpoint registration and unrivalled repeatability. It even lets you print on a wide variety of low-cost materials.

Best of all, SmartJet images are so luminous and richly detailed, you'd swear you were looking at a photograph. That's something no other printer can do.

So whether you're in graphic arts or textiles, cartography or packaging, product design or desktop publishing, the question is the same: *Why trust your first-rate ideas to a second-rate printer?* Especially when you can get SmartJet output for the lowest cost-per-image in the industry.

Call 617-275-8777 today and ask for a sample SmartJet print. We'll also include information about our large-format printers.

The SmartJet. Once you've seen what it can do, you'll never want to toy around with another color printer again.

IRIS
a scitex company

IRIS Graphics, Inc., Six Crosby Drive, Bedford, MA 01730

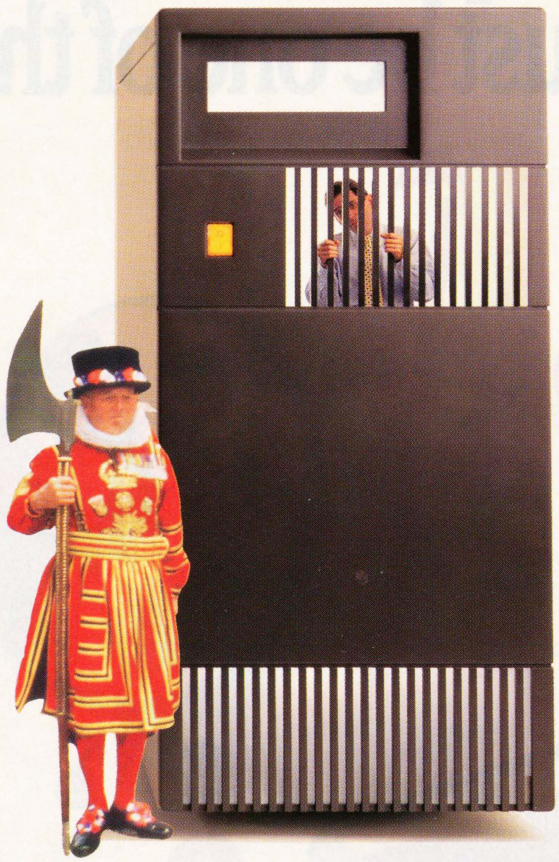
MW EDITORS' CHOICE

SmartJet selected as Editors' Choice by Macworld Magazine, April 1992.

SmartJet is a trademark of IRIS Graphics, Inc. PostScript is a registered trademark of Adobe Systems, Inc.
Original photo courtesy of Comstock, Inc.

CIRCLE 22 ON INFORMATION CARD

Don't get locked into a tower.

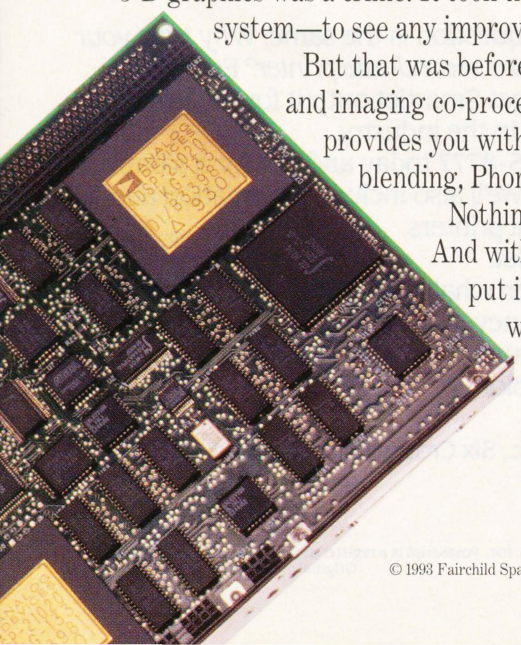


When you can free yourself with the card.

Until now, what you had to go through to increase the speed and productivity of your SPARCstation™ 3-D graphics was a crime. It took the power of a tower—and all the inconvenience of integrating one into your system—to see any improvement at your workstation.

But that was before Fairchild Defense created TRU-D™—a high performance 3-D graphics and imaging co-processor card that plugs right into your Sun™ workstation. TRU-D immediately provides you with unique hardware functions like true perspective polygon texturing, pixel blending, Phong shading and image warping.

Nothing else in the field can match TRU-D's performance—at TRU-D's price. And with complete Sun Open Graphics Initiative™ compatibility all you have to do to put it to work is "plug and play." So give yourself time off for good behavior—with TRU-D. **For more information, call 1-800-627-8783.**



KEYING IN ON A NEW REALITY©

V.A.R./Reseller Inquiries Welcome

All trademarks (TM) are the property of their respective holders.
© 1993 Fairchild Space & Defense Corporation. Beefeater photograph compliments of British Tourist Authority.

CIRCLE 23 ON INFORMATION CARD

SOFTWARE MAKES IT EASY

Unlike printers, fax machines, and copy machines, a scanner is useless without application software. Image-editing and optical character recognition (OCR) software are the most common types used with scanners.

Image-editing software has improved dramatically over the past few years, driven by more competition and more demanding users. Photoshop from Adobe (Mountain View, CA), PhotoStyler from Aldus, Picture Publisher from Micrografx (Richardson, TX), and Image-In from the Minneapolis-based company of the same name are among the better-known image-editing packages for the Macintosh or Windows platforms. Painter from Fractal Design (Pacific Grove, CA) and Ofoto from Light Source (Larkspur, CA) are also favorites among scanner users, even though they are not strictly classified as image-editing programs. Specialized packages, like PixelCraft's Color Access, are also available to offer advanced functions. Some of the most sophisticated software packages are still proprietary, developed specifically for use with a particular high-end scanner.

A new image-editing category has emerged for novice users. Packages such as Image Assistant from Caere Corp., Corel Draw from Corel Systems (Ottawa, Ontario), Image Wizard from ImageWare (San Diego), Halo Imager from Media Cybernetics (Silver Spring, MD), PhotoMagic from Micrografx, and PhotoFinish from ZSoft (Marietta, GA) use visual feedback and simplified user interfaces to make image manipulation more intuitive.

OCR software, which lets users convert scanned or faxed documents into editable text, is a tremendous productivity tool in scanning and has improved dramatically in recent years. Today's OCR packages can convert and replicate multicolumn, mixed-font pages and put the results in leading word processing, page layout, or spreadsheet software programs. They are fast and accurate, read almost any font, and retain the page layout. Popular OCR packages are available from the likes of Caere, Calera (Sunnyvale, CA), Expervision (San Jose, CA), Ocron Inc. (Santa Clara, CA), Recognita (Sunnyvale, CA), and Xerox Imaging Systems (Peabody, MA). Some of these vendors have even embedded their OCR engines into fax software and various document management packages, to allow users to convert their documents on-the-fly.

Scanner users rely on many other software applications to streamline their work. Image cataloging packages, such as Fetch from Aldus and Image Pals from U-Lead Systems (Torrance, CA), have become popular desktop accessories. Color calibration software, like Cachet from Electronics for Imaging (San Mateo, CA) and Color Access from PixelCraft, are a necessity for color professionals. Paint and draw programs are also standard equipment, giving users the special painting effects and raster-to-vector conversions needed for all types of image work. Even CAD programs are sometimes used for advanced design work.

Research shows that most users buy a scanner for one particular application, then expand into other uses as they grow familiar with the equipment and its capabilities. Fortunately, the field of scanning appli-

true, or optical, resolution represents the actual number of data points the scanner can capture along an inch. Sometimes dpi is measured in two dimensions: horizontal and vertical, as in 300-by-300 dpi. In a flatbed scanner, which captures an image line by line using a charge-coupled device (CCD) array, the horizontal measurement represents the actual sampling of the CCD; the vertical measurement is determined by the number of samples the CCD takes as it moves down an image. Some scanners slow the movement of the CCD so that it takes more samples per vertical inch, resulting in a higher true resolution (300-by-600 dpi).

INTERPOLATED RESOLUTIONS

Interpolation comes into play when the scanner, through software, doubles or quadruples the number of actual samples it gets. This is usually done by averaging adjoining dots and plotting the midpoint. In this way, a 300-by-600dpi scanner can be used to produce a 600-by-600dpi image. The scanner's true (input) resolution would be 300 dpi, but its interpolated (output) resolution would be 600 dpi. There are different ways to mathematically interpolate to higher resolutions, and some are better than others. The most advanced methods may require a few moments longer to process the image, but the difference can be noticeable where top quality is important.

Most users mistakenly believe that more resolution is better, so vendors have been forced into selling their scanners on the basis of higher resolution. Unfortunately, many vendors are lax in clarifying the numbers they quote in their ads—are they quoting true or interpolated resolution? Even resellers can get confused, convinced that the scanner they are selling really does offer 600 or 800 dpi, when in fact the CCD resolution is half that number. While the quality difference may not be noticeable to some users, it is important to understand what the scanner is actually "seeing" and not be dazzled by unsubstantiated claims. The best way to be sure of a scanner's resolution is to ask the vendor or dealer for the optical, or true, input resolution in both horizontal and vertical dimensions.

Although resolution is the easiest scanner feature to understand, several other factors are equally important to getting good-quality output from a scanned image.

One of these is the pixel depth, or the number of bits per pixel the scanner can capture. The greater the pixel depth, the more colors or shades of gray a scanner can "see," and the wider the range of shades the scanner has to choose from to replicate the actual shades in the original image.

Most flatbed color scanners capture 8 bits per color, or 24 bits (8 bits multiplied by the three primary colors of red, green, and blue), while many film scanners capture 10 or more bits per color. The trade-off for capturing more bits per pixel is memory; file sizes increase exponentially with each increase in pixel depth. Also at issue is cost—generally only scanners costing $4000 or more offer a pixel depth of more than 24 bits per pixel.

Another factor contributing to a scanner's image-capture quality is the processing that takes place inside the scanner or scanning software. Many scanners, especially higher-priced units targeted for professional publishing, contain special features designed to optimize each scanned image. Such features might include advanced algorithms for sharpening, focus, noise removal, automatic brightness and contrast adjustment, dynamic

Several scanning options—including the motorized ScanMaker Scooter (left) and the multiformat, 1000dpi ScanMaker 45t (above)—are available from Microtek.

thresholding, color optimization, even on-board compression. These image processing functions are extremely important in fine-tuning an image and will likely drive future performance improvements in scanner technology.

The actual mechanics of the scanner also can greatly impact its image-capture quality. For example, higher-quality, higher-priced scanners use lamps that cast pure, bright, stable light. Ideally, the intensity and color of the lamp should neither change over time nor grow dim at the edges. However, lamps generally must be replaced after time, and many manufacturers are simplifying the procedure by making the lamp a simple pop-out-and-replace component. Another mechanical feature important to high-quality image capture is a sturdy transport mechanism, which guarantees that the CCD movement is precisely controlled, minimizing "jiggle" and ensuring accurate registration. The lenses and mirrors inside the scanner can also affect quality; glass lenses versus plastic are generally viewed as producing optimal results.

The software that comes with a scanner also can have tremendous impact over scanning quality and ease of use. All scanners come with basic scanner driver software, which commands the scanner. In higher-end scanners, the software gives the user control over all the variables that can influence a scan, such as brightness, contrast, scan area, white/black point, color correction curves, on-the-fly unsharp masking, color separation, RGB-to-CMYK conversion, and descreening. The scanner and software are designed to maximize each other's capabilities, resulting in the best possible scan.

Last but not least is color accuracy, an important measure of quality and something that has become a constant quest of scanner manufacturers.

In general, the importance of color accuracy to users depends upon their application. For instance, for casual office scanning (preparing presentations and employee newsletters), "good-enough" color can be obtained in scanners costing less than $1000. Most casual users would not notice a lack of color fidelity, unless they compared a scan side by side with a higher-quality image or with an expected outcome (such as the blue in a company logo or the skintone of a co-worker), and the typical office does not have display devices or output devices that can accurately reproduce a color image. However, for professional graphic artists, nothing less than the best possible color will do. Fortunately, drum scanners and high-end flatbed scanners are available to produce such results (these units cost much more and are not covered in the scope of this article).

A variety of hardware factors play a critical role in making color accurate. These factors include more sophisticated light separation technologies and dedicated processors that enhance and correct color. Many vendors have argued whether single-pass (capturing red, green, and blue in one exposure of the CCD) or three-pass (capturing one color per exposure) technology is better, but there are no hard and fast rules. Single-pass scanning can be faster and generally produces more accurate registration of colors; scanning in three passes can allow the device to capture more accurate color by compensating for differing light intensities—boosting the weaker blue signal, for example. But there are exceptions to both cases, so it is best to base a purchasing decision on overall color quality, not on which method of capture a scanner uses.

Now that these issues of market trends and technology improvements have been discussed, it's time to get down to the nitty-gritty. Although there are many flatbed and film scanners to choose from, a careful analysis of the jobs the scanner will be required to perform can quickly narrow the field to a few models. Then pricing and availability can make the final decision.

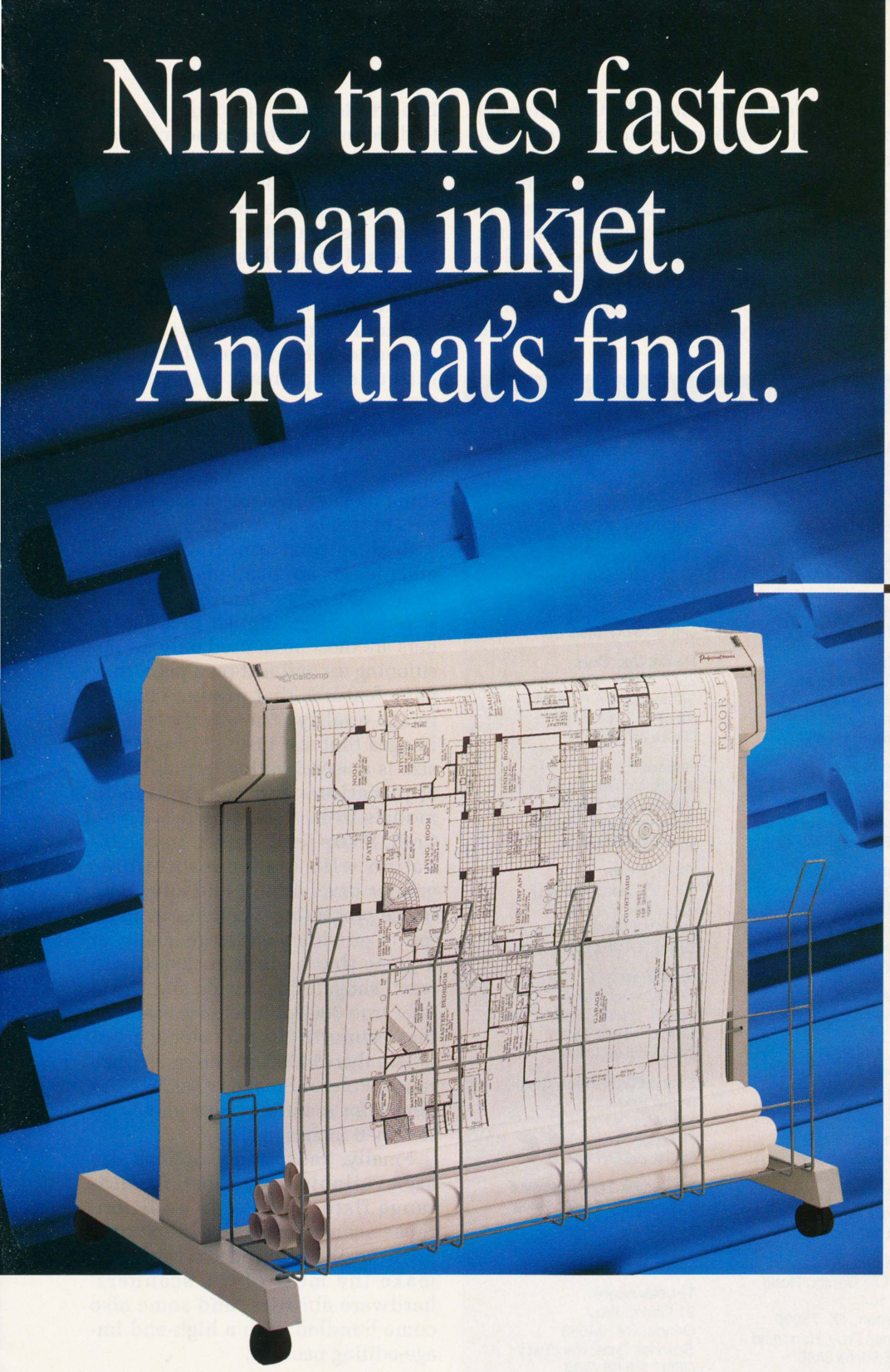
THE LOWDOWN ON FLATBEDS

Flatbed scanners are ideal for scanning reflective art, bulky objects such as books or cardboard-backed graphics, or pages of text for OCR. The most common flatbed models are designed to be all-around performers, combining low price, 24-bit color, letter- or legal-size scan area, and bundled image-editing software.

Generally, flatbed scanners are available with options to serve users' different needs. For instance, automatic document feeders (ADFs), which list for around $500 to $700, allow users to stack up to 50 documents in the input tray for unattended scanning. Some ADFs can be attached or removed with the flick of a pin, while others can be mounted more permanently.

Also available are transparency options, which are used for scanning transmissive originals. These options vary widely in their technical quality, size, and price. It's im-

Nine times faster than inkjet. And that's final.



One CalComp DrawingMaster plotter can handle the output of an entire network by itself. You get final quality plots in as little as 71 seconds.* Inkjets don't even come close to the speed and convenience of direct imaging.

DrawingMaster.® Final plots in about a minute.

And there are no pens, cartridges or toners to mess with. Just load a roll of media for crisp, high resolution plots in one or two colors. All our advanced direct imaging media provide exceptional durability, reproduction, and archivability. They're recyclable, as well.

You've waited long enough. See the plotter that will eliminate those bottlenecks forever at your participating "Value Add Vantage" reseller. Or **call 800-932-1212, ext. 453** for the CalComp reseller nearest you.

HIGHLY '93 C CADalyst RECOMMENDED

Here's a quick $1,000 if you buy before December 23, 1993!

It's your choice. *Get a FREE Model 981 Ethernet interface to share DrawingMaster's superior productivity with everyone on your LAN. A $995 value!*

Or *choose a selection of CalComp direct imaging media worth up to $1,000 retail value for the best output, every time, guaranteed. Your participating reseller has full details.*

We draw on your imagination.™

CalComp
A Lockheed Company

*Based on average D-size monochrome plot. Average E-size plot takes less than 2 minutes. Special offer expires 12/23/93. Amounts in U.S. Dollars. DrawingMaster and We draw on your imagination are trademarks or registered trademarks of CalComp Inc. Plot courtesy of AutoDesk, Inc. © 1993 CalComp Inc. All rights reserved.

CIRCLE 24 ON INFORMATION CARD

portant to be aware of the maximum scan area of a transparency option; not all are designed to scan a full letter-size image.

A CCD resolution of 300 dpi is still common in today's flatbed scanners, but these days most flatbed units offer true 600dpi resolution on the vertical axis. Flatbed scanners from Apple, AVR, Epson, Hewlett-Packard, La Cie, Microtek, Mustek, Panasonic, Sharp, Tamarack, and Umax offer interpolation to 600 by 600 (sometimes more), making them excellent low-cost devices for general-purpose scanning.

A few flatbed scanner vendors, including AVR and HP, offer true 400dpi scanners designed to be slightly more versatile for scanning line art. Recently, spurred by a need to differentiate their product offerings, some vendors have introduced true 600dpi scanners priced to compete in the general-purpose marketplace. Dextra, Microtek, Mustek, Relisys, Tamarack, and Umax have each announced such devices, ranging in price from $1799 to $2499, and more announcements are expected to follow. Where high resolution is of primary importance, these scanners will be welcome additions to the market. Otherwise, users might find the color accuracy, speed, and overall image quality of some of the lower-resolution scanners to still be superior.

Professional publishing and graphic arts applications are served by a "mid-range" family of flatbed scanners. Even though these scanners are most often used only for positioning art and text on a page, they have features that produce higher image quality. The ability to scan images that are 11-by-17 inches in size is a useful option in publishing applications and is supplied in models from Agfa, Howtek, PixelCraft, Sharp, and Truvel, in combination with higher resolutions, greater pixel depth, and advanced image processing functions. In an effort to provide high image quality at a price that's more accessible to small shops, Agfa, Ricoh, and Umax offer true 600dpi letter-size scanners that feature 10 bits per color at a cost of less than $4000. In the same price range, Polaroid makes a fast 500dpi device for scanning color photos up to 4-by-6 inches in size.

Finally, transparency options also are available for almost all mid-range flatbed units. In addition, these scanners are likely to come with sophisticated drivers that make the most of the scanners' hardware abilities, and some also come bundled with a high-end image-editing package.

SLIDE/TRANSPARENCY SCANNERS

Film scanners capture images from transmissive media, such as slides or transparencies. These units allow light to pass through the image, giving the scanner the best possible opportunity to see all the detail in the original image. Most film scanners are targeted for graphic arts

SCANNER VENDORS

Agfa/Division of Miles Inc.
200 Ballardvale St.
Wilmington, MA 01887
Scanner Type: Flatbed, Film
CIRCLE 231 ON CARD

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
Scanner Type: Flatbed
CIRCLE 232 ON CARD

AVR Technology Inc.
71 E. Daggett Drive
San Jose, CA 95134
Scanner Type: Flatbed
CIRCLE 233 ON CARD

Caere Corp.
100 Cooper Court
Los Gatos, CA 95030
Scanner Type: Handheld
CIRCLE 234 ON CARD

Dextra
5201 Great America Parkway
Suite 320
Santa Clara, CA 95054
Scanner Type: Flatbed
CIRCLE 235 ON CARD

Eastman Kodak Co.
343 State St.
Rochester, NY 14650
Scanner Type: Film
CIRCLE 236 ON CARD

Envisions Solutions Technology Inc.
822 Mahler Road
Burlingame, CA 94010
Scanner Type: Flatbed, Handheld
CIRCLE 237 ON CARD

Epson America Inc.
POB 2842
Torrance, CA 90509-2842
Scanner Type: Flatbed
CIRCLE 238 ON CARD

Hewlett-Packard
3000 Hanover St.
Palo Alto, CA 94304
Scanner Type: Flatbed
CIRCLE 239 ON CARD

Howtek Inc.
21 Park Ave.
Hudson, NH 03051
Scanner Type: Flatbed
CIRCLE 240 ON CARD

KYE International Corp.
2605 E. Cedar St.
Ontario, CA 91761-8511
Scanner Type: Handheld
CIRCLE 241 ON CARD

La Cie Ltd.
8700 S.W. Creekside Place
Beaverton, OR 97005
Scanner Type: Flatbed
CIRCLE 242 ON CARD

Leaf Systems Inc.
250 Turnpike Road
Southboro, MA 01772
Scanner Type: Film
CIRCLE 243 ON CARD

Logitech Inc.
6505 Kaiser Drive
Fremont, CA 94555
Scanner Type: Handheld
CIRCLE 244 ON CARD

Microtek Lab Inc.
680 Knox St.
Torrance, CA 90502
Scanner Type: Flatbed, Film, Handheld
CIRCLE 245 ON CARD

Mustek Inc.
15225 Alton Parkway
Suite 100
Irvine, CA 92718
Scanner Type: Flatbed, Handheld
CIRCLE 246 ON CARD

Nikon Inc.
Electronic Imaging Dept.
1300 Walt Whitman Road
Melville, NY 11747
Scanner Type: Film
CIRCLE 247 ON CARD

Nisca Inc.
1919 Old Denton Road
Suite 104
Carrollton, TX 75006
Scanner Type: Handheld
CIRCLE 248 ON CARD

Panasonic Communications Systems Co.
Office Automation Group
2 Panasonic Way
Secaucus, NJ 07094
Scanner Type: Flatbed
CIRCLE 249 ON CARD

PixelCraft Inc.
POB 14467, #8
Oakland, CA 94614-2467
Scanner Type: Flatbed, Film
CIRCLE 250 ON CARD

Polaroid Corp.
575 Technology Square
Cambridge, MA 02139
Scanner Type: Photo
CIRCLE 251 ON CARD

RasterOps Corp.
2500 Walsh Ave.
Santa Clara, CA 95051
Scanner Type: Film
CIRCLE 252 ON CARD

Relisys
320 S. Milpitas Blvd.
Milpitas, CA 95035
Scanner Type: Flatbed
CIRCLE 253 ON CARD

Ricoh Corp.
3001 Orchard Parkway
San Jose, CA 95134
Scanner Type: Flatbed
CIRCLE 254 ON CARD

ScanView Inc.
1175 Chess Drive
Suite A, Foster City, CA 94404
Scanner Type: Drum
CIRCLE 255 ON CARD

Sharp Electronics Corp.
Sharp Plaza
Mahwah, NJ 07430
Scanner Type: Flatbed
CIRCLE 256 ON CARD

Tamarack Technologies
1544 Centre Pointe Drive
Milpitas, CA 95035
Scanner Type: Flatbed
CIRCLE 257 ON CARD

Thunderware
21 Orinda Way
Orinda, CA 94563
Scanner Type: Handheld
CIRCLE 258 ON CARD

Truvel
520 Herndon Parkway
Herndon, VA 22070
Scanner Type: Flatbed
CIRCLE 259 ON CARD

Umax Technologies Inc.
3353 Gateway Blvd.
Fremont, CA 94538
Scanner Type: Flatbed
CIRCLE 260 ON CARD

To better the competition was easy. To better ourselves took some effort.

In 1990, the ad above proved our DMP™-60 DL Series plotters were three times faster than the competition. In 1991, we introduced our DMP-160 Series which released your computer up to 30 times faster. Now comes the HiPlot 7000 Series, the new standard in pen plotters engineered to outperform our toughest competition — our old plotters.

The highest quality at the highest acceleration. HiPlot Series combines 5.7g acceleration with an enhanced media-movement system to deliver the industry's highest-quality CAD plots — and up to 3 1/2 times faster than the competition. This advanced technology includes a new drive system and platen design that moves the media firmly and rapidly while eliminating skipping, stray marks and media stress. And our "plotting on air" technique reduces pen tip wear for consistent, high-quality lines.

Everything in the box. As the chart shows, HiPlot comes packed with power. Plus you get real and protected mode ADI® drivers; a HI® Queue plot management/remote configuration program for network or multi-user environments; and our innovative Priority Response™ Replacement Warranty. All at a very competitive price. A SCAN-CAD™ accessory is also available to turn the plotter into an affordable large format scanner.

The most productivity for the money. Pen plotters still offer the most affordable, high-quality, color output for large format CAD. And HiPlot is the most plotter for your money. For your local dealer or information call 1-800-444-3425.

	Accuracy	Speed	Acceleration	HP-GL/2	Buffer	Plot Time*	Release Time*
HiPlot	0.10%	45ips	5.7g	Yes	1MB	25:17	2:44
CalComp® Pacesetter	0.10%	42ips	2.8g	No	64k	29:03	26:16
HP DraftPro® DXL	0.20%	32ips	2.8g	No	31k	44:08	41:55

* Using AutoCAD®'s AD-AS007. DWG Drawing File.

New HiPlot® 7000 Series

HOUSTON INSTRUMENT
Summagraphics®

©1993 Summagraphics Corporation. All rights reserved.

CIRCLE 25 ON INFORMATION CARD

applications. Agfa, Kodak, Leaf, and Nikon offer 35mm slide scanners in the $6000 to $10,000 range, suited for the production environments of graphic artists and publishers. Leaf, Microtek, and PixelCraft offer so-called "multiformat" scanners which can scan both slides and 4-by-5-inch transparencies. A drum scanner vendor called ScanView competes in this category with a $13,000 transparent/reflective drum scanner capable of scanning images in sizes from 35mm to 8-by-10 inches.

Lower-cost slide scanners, ranging in price from $1700 to $2500, are available for position-only work from Microtek and Nikon. These scanners have improved greatly in price and performance over the past year, making in-house slide scanning affordable to many new users—scientists, educators, anyone with a need to input slides.

As more people switch from film-based image storage to electronic image storage and retrieval in the coming years, the market for film scanners is expected to grow rapidly. Until digital cameras can replicate the quality afforded by scanning a film negative or positive, film scanners will remain the most practical solution for inputting high-quality images.

TWAIN COMPATIBILITY

But while a lot of progress has been made in scanning technology, there's still room for improvement. For example, the TWAIN API is currently supported by only a fraction of today's scanning hardware and software products. Although most vendors have announced future compliance, not all have prioritized it. Most in the industry agree, however, that once vendors realize users are basing product decisions on TWAIN compatibility, the proliferation of such products will accelerate and TWAIN will extend beyond scanning software into more general-purpose applications. This widespread adoption will benefit users by providing an unlimited range of products from which to choose. It will also allow vendors to spend more resources in research and development and product improvement, instead of in writing device drivers for every possible product combination on the market.

Also watch for scanners with built-in intelligence to automate and perfect image capture. Already many image-editing programs have added such intelligence. Special application-specific integrated circuits (ASICs) might also be used inside the scanner to perform operations in real time.

All told, we can expect more performance out of scanners and software in the future. New models and versions will provide better images more efficiently at a lower cost. Don't expect any major technology breakthroughs, though; more likely, the entire image-acquisition process will gradually improve, along with improvements in equipment base, including hardware platforms, application software, output devices, and the scanners themselves.

So it's best not to put off getting a scanner. Instead of waiting for the technology to plateau (which will be sometime after the millennium), you can jazz up your work and increase productivity now with the best of today's color flatbed and film scanners and software. *CGW*

Winsted®

VIDEO WORK STATION

Desktop Convenience For
Today's Multimedia Electronics.

Integrated workstation provides a full 72″ wide work surface. Both keyboard shelf and plotter shelf pull out 3″, tilt 0°-5°, and adjust 3″ up or down. Spacious 19¼″ Rack Cabinet rolls on swivel casters.

• Ergonomic design for user comfort. • Ample work area and storage space. • Attractive 2-tone finish in Dove Grey and Black Granite.

For FREE CATALOG, write or call TOLL-FREE 1-800-447-2257

THE WINSTED CORPORATION

10901 Hampshire Ave. So. • Minneapolis, MN 55438 • FAX 612-944-1546

Preferred by Professionals Worldwide

CIRCLE 26 ON INFORMATION CARD

6th GOVERNMENT PUBLISHERS SEMINAR

November 16, 1993 • Washington, DC

Here is your primary opportunity to learn first-hand about the technologies and the management issues for publishing in all its forms specifically for government applications. This seminar will help to bring government publishing specialists together to share information and review alternatives.

As desktop publishing use grows, with stronger links to office automation, we will be forced to re-evaluate systems approaches.

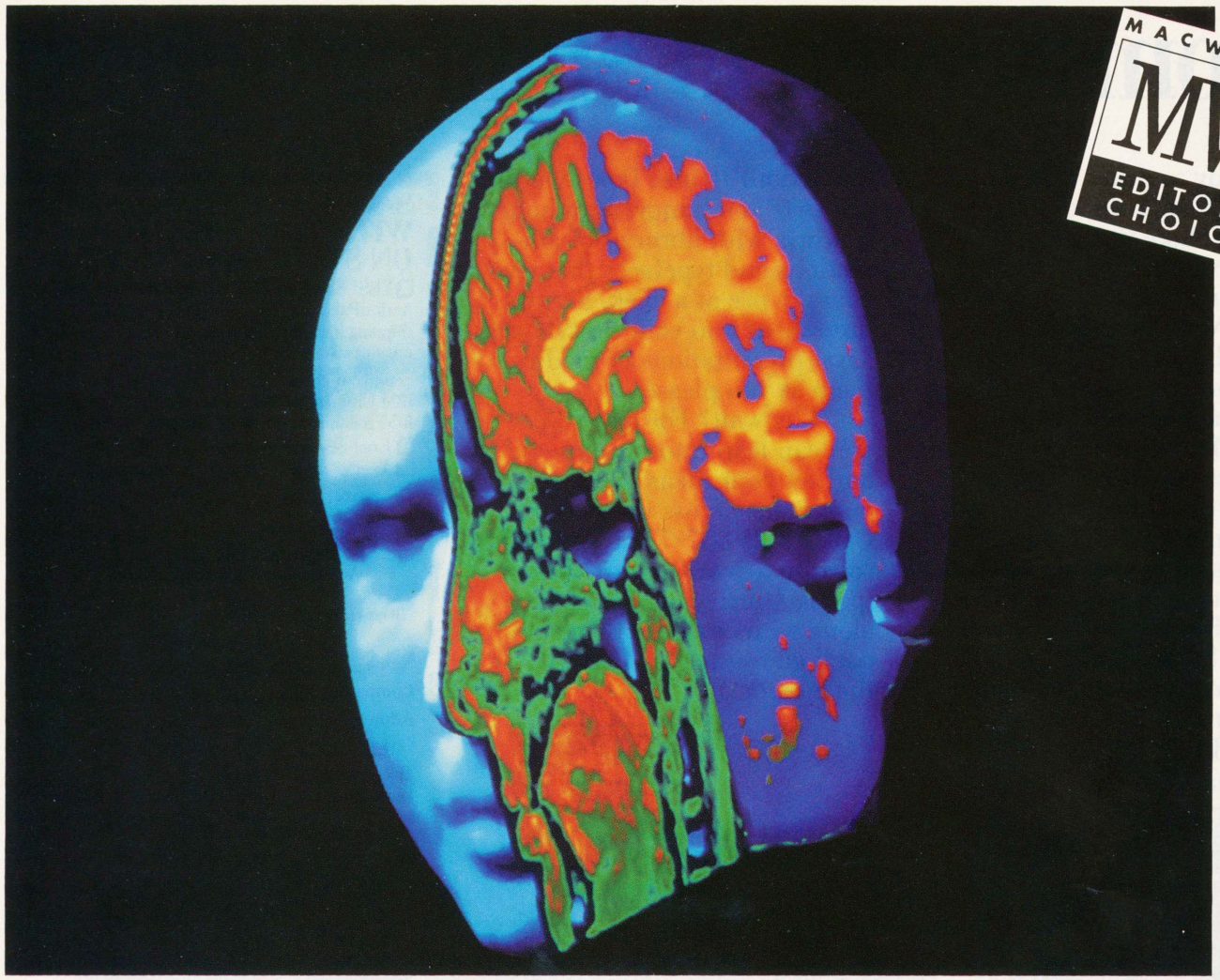
Frank Romano, editor-in-chief of *Electronic Publishing*, presents a unique blend of consultant, vendor and user perspectives to allow maximum information sharing in a minimum amount of time. Attendance will be limited to permit audience and speaker interaction.

Sponsored by:

ELECTRONIC PUBLISHING
TypeWorld

Call 508-392-2187 now for a free seminar brochure!

CIRCLE 27 ON INFORMATION CARD



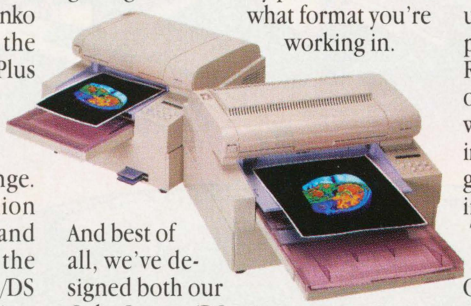
Brain scan courtesy of Visual Numerics, Inc.

WHEN THE WORK YOU DO IS THIS IMPORTANT, THE PRINTER YOU USE HAD BETTER BE THIS GOOD.

There may be some printing applications where highly accurate imaging isn't critical. But yours isn't one of them. Which is why we've developed the Shinko CHC-S446i ColorStream/DS and the new CHC-S746i ColorStream/DS Plus dye-sublimation printers.

Designed with enormous memory capacity, they can outpace any printers in their price range. And the prints? With 16.7 million colors available at every pixel and dazzling 300 DPI resolution, the ColorStream/DS and ColorStream/DS Plus produce exactly the sort of crisp, vivid, precise images that technical work consistently demands.

What's more, the ColorStream/DS' 8.5" x 11" printing area and the full 11" x 17" printable area offered by the new DS Plus mean that you can count on getting extraordinary prints no matter what format you're working in.



And best of all, we've designed both our ColorStream/DS printers to fit beautifully into the future. Their two Feature Card slots let you take full advantage of innovations like Pipeline's PowerPage® 24-bit PostScript®-compatible interpreter – or accommodate other future font and emulation upgrades – by simply inserting a new ROM card. And all of our printers now ship with PostScript Level 2 interpreters built in, to give you the ultimate in printout control.

At the heart of our ColorStream/DS printers is the remarkable new Am29050 RISC processor for high-performance, high-speed color imaging.

The ColorStream/DS and the new, larger format ColorStream/DS Plus. Outstanding printers that take your work just as seriously as you do.

To learn more, or to place your order, call Mitsubishi International at (914) 997-4999 or (415) 496-5447.

CIRCLE 28 ON INFORMATION CARD

SHINKO

Mitsubishi International Corporation

The technology behind the color.©

Mitsubishi International is the sole distributor of Shinko color products in North America. All ® registermarks and ™ trademarks are their respective manufacturers'. PowerPage is a registered trademark of Pipeline Associates, Inc. AGFA Now with support for Agfa's FotoTune.™
©1993 Mitsubishi International. All rights reserved.

From Screen To Shining Screen

Get ready to drum up a storm. Play to the masses, or woo the experts. Make yourself a hero with ideas that really travel–to an audience that spans continents! Now it's easy, fun and affordable to create multimedia presentations that can play audio and video on virtually any IBM or compatible system–with Storyboard Live! 2.0.

Storyboard Live! 2.0 lets you combine audio, video, graphics and animation without having to upgrade your PC or your skills. Act now, and you can get Storyboard Live! 2.0 *plus* two great complementary programs, ActionPak and Typestyles II, for just $339.95. (Less than half their combined retail price of $695!)

ActionPak and Typestyles II can save you hundreds of hours of work, with libraries of animations and typefaces that are yours to use at a click. Simply drop them into your Storyboard Live! presentations or modify them as you please.

Why wait? For just $339.95 you can leap into multimedia and set your ideas marching on screens across the nation. Call **1-800-887-7771, ext. 517** to take advantage of this special, limited time offer along with our 30-day, money-back guarantee or send in the coupon.

IBM®

SAVE MORE THAN $300.00 WITH THIS SPECIAL OFFER ON STORYBOARD LIVE! 2.0

❑ YES! Send me Storyboard Live! 2.0 *plus* ActionPak and Typestyles II for just $339.95, shipping included! If I'm not satisfied, I may return my software within 30 days for a full refund.

Send your check or credit card details to:
IBM Ultimedia Tools Series,
1055 Joaquin Road, Mountain View, CA 94043.

❑ Enclosed is my check
❑ Visa ❑ Mastercard ❑ American Express

Card Number_____Exp. Date_____

Signature_____

Storyboard Live! 2.0 *plus* ActionPak and Typestyles II:	$ 339.95
Local Sales Tax: (If tax-exempt, please supply your I.D. no.)	_____
Total:	_____

Name_____

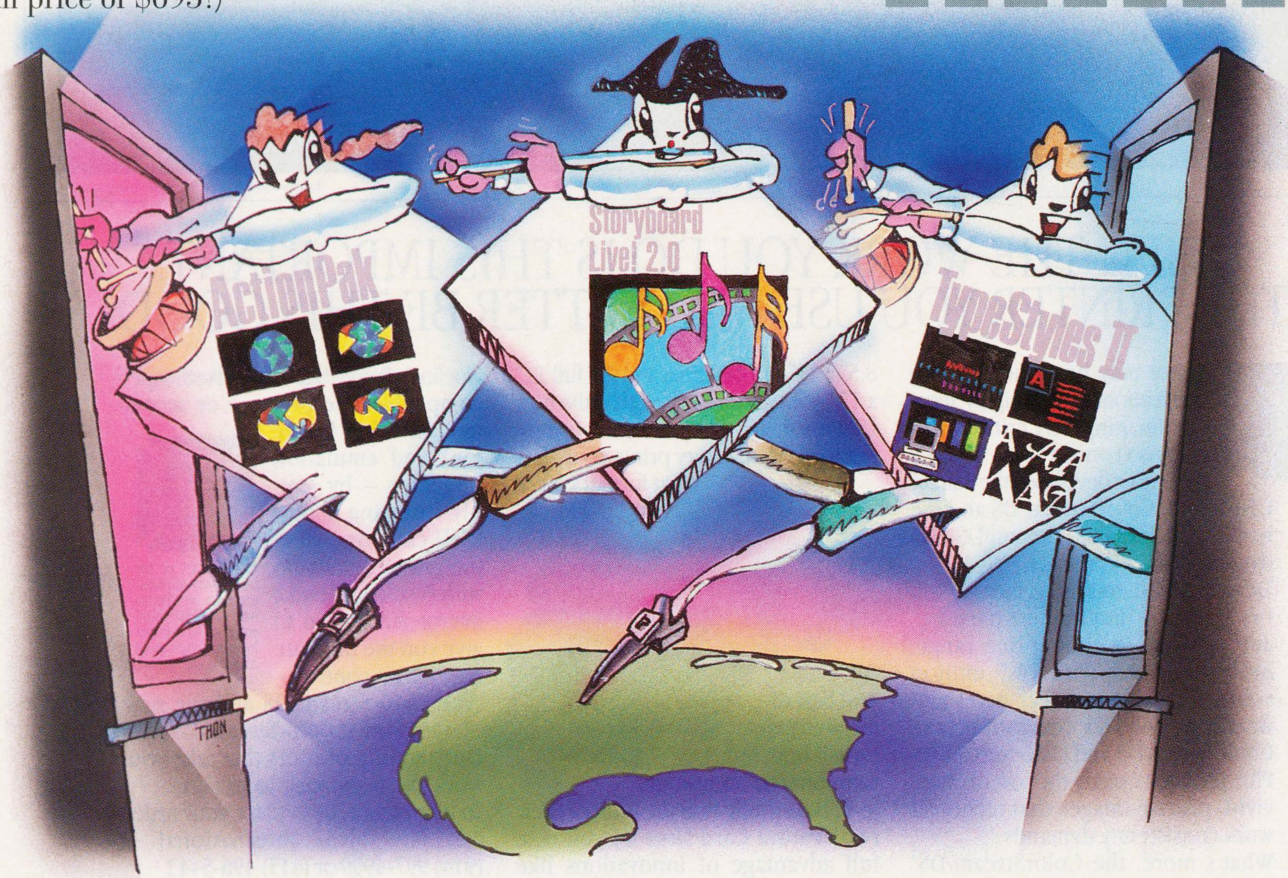
Company_____

Address_____

City_____State_____Zip_____

Telephone_____/_____

For faster service call 1-800-887-7771 ext. 517



ULTIMEDIA TOOL SERIES

ULTIMEDIA TOOL SERIES MAKES MULTIMEDIA WORK FOR YOU

Minimum requirements: IBM PC, PS/2 or compatible system with one diskette drive (3.5 inch, 720KB) and a fixed disk; EGA, VGA, SVGA or compatible graphics adapter with appropriate color display; IBM PS/2, Microsoft or compatible mouse (optional, but recommended); 512KB in memory (excluding DOS) DOS 3.3 or higher. ®IBM and PS/2 are registered trademarks of International Business Machines Corporation. ™Storyboard is a trademark of International Business Machines Corporation.

©1993 IBM Corp. All Rights Reserved

CIRCLE 30 ON INFORMATION CARD

Image courtesy of Asymetrix

A BEGINNER'S GUIDE TO

MULTIMEDIA

BY ELIZABETH WOOD

Multimedia applications can take any number of forms, from a fairly basic animated electronic slide show to a computer-based training program to an interactive, disk-based sales presentation. Whatever the form, though, multimedia introduces a new way of communicating information.

Does this mean the information is better? Maybe. Does this mean the information is more memorable? Definitely! Without a doubt, multimedia applications turn the average desktop computer into a high-powered information delivery device.

As multimedia technology matures, more and more people and companies are starting to make use of it to deliver their messages. But for those who are new to the technology, getting started in multimedia can be a daunting challenge. What do you need? Where do you begin?

One place to begin is with the hardware. If you're going to create a multimedia

presentation, you're going to need some special hardware. The most important fact to remember when setting up a multimedia system is that speed is power. Each component you place into your multimedia system, therefore, should be optimized for speed.

Configuring Your Base System

In the IBM PC-compatible world, you'll want to choose at least a '486-based system. In the Apple world, the system of choice is the Quadra. The processor speeds of these machines will be critical when playing software-only video like Microsoft's Video for Windows or Apple's QuickTime. Likewise, other components in your computer will depend upon the speed of your main processor.

In terms of memory and storage capacity, the one thing you quickly learn when creating multimedia applications is that you can never have enough. The average graphics image uses from 15KB to 500KB of storage space, while a "1-ding" audio file uses 11KB. Music audio files and voice-over files that are minutes in length can be several megabytes in size. Video and animation files are even larger.

With that in mind, you'll want at least 8MB of RAM and more if you are serious. Sixteen, 32, and even 64 megabytes of RAM are not too much. As for hard-disk storage space, be sure to start with a minimum 300MB.

Besides power, multimedia also means color! Creating a multimedia presentation with a 16-color VGA display is like watching the opening ceremonies of the Olympics on a black-and-white television. If you're spending the extra effort needed to do multimedia, you will want a minimum of 256 colors. A standard VGA card produces 256 colors, but only at 320-by-200 resolution. And at that resolution, your type will appear very jagged.

So my advice here is to get a graphics card that can produce at least 256 colors at a resolution of at least 640 by 480. This means that the card you buy must have a resolution of Super VGA or better. Some display cards give you 24-bit color, for a dazzling display of up to 16 million colors. These are great for photo-retouching and color prepress work, but they may be overkill for most multimedia applications and may slow down your application. They'll also be several times more expensive.

The Cost of Multimedia

The cost of multimedia varies depending on how serious you are. The following list is a broad guideline of expected costs.

- Less than $3000 for an IBM or compatible '486 with 16MB RAM, 300MB hard drive, SVGA card, monitor, and mouse
- $100-$500 for an audio card
- $5-$50 for a microphone
- $25-$100 for speakers
- $200-$2000 for a color scanner
- $200-$1000 for a CD-ROM drive
- $500-$5000 for a video-capture card
- $49-$6000 for each software program. Average program cost: $595

Capturing Images

Once you've got your base system, the next step is to decide what kind of peripherals and add-on products you need. A good place to start when trying to make that decision is to think about the kinds of pictures you want to input into your multimedia application.

There are a number of ways to get pictures into a computer, with three of the most common ways being through the use of color scanners, pre-digitized images, and video capture equipment.

Color scanners are available in several models. Hand-held scanners are relatively inexpensive but have the drawback of being able to scan only a 6-inch-wide image. As a result, images larger than 6 inches need to be scanned in pieces and "stitched" together with a software application. This takes time.

Flatbed scanners are a more popular choice among multimedia users. These allow you to scan photographs and anything else that will lay on the glass platen of the scanner.

If your original images are slides or transparencies, you will need a scanner that is designed for slides. Some flatbed scanners have an optional slide-scanning feature. Some scanners scan only slides or transparencies.

Another way to get images into your presentation is to use pre-digitized photographs and clip art stored on CD-ROM discs. In the last year or so, we've seen an explosion in the number of CD-ROM-based image libraries. Today you can buy discs that contain picture libraries featuring everything from sunsets and waterfalls to animals and babies. And since a CD-ROM disc can store up to 660MB of data, each disc often contains 100 or more images.

Sample File Sizes

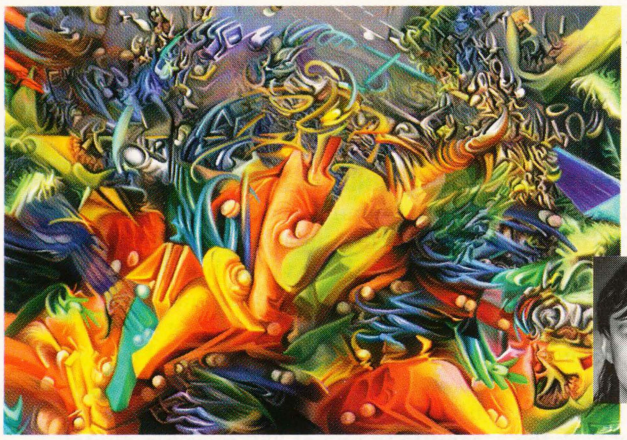
- 10 fax pages = 640KB
- 500 pages of text = 1MB
- 10 full-color, detailed images = 75MB
- Five minutes of uncompressed 8-bit audio at 11KHz = 2.4MB
- Ten minutes of CD-quality audio (16 bits at 44KHz) = 52.8MB
- One minute of uncompressed 1/4-screen, animation-quality video = 147MB
- One minute of 1/4-screen, animation-quality video compressed at 100:1 = 1.47MB
- 100:1 compression of a two-hour, TV-quality VHS = 2GB (2 billion bytes!)

Today, even the traditional stock photo houses publish their catalogs on CDs. The photos in these CD catalogs are in low-resolution files. To use the photos for print media, you'll need to contact the stock photo house, and they'll send you the original slide or a high-resolution version of the file. For electronic presentations, however, the low-resolution file may be fine. Just be sure to check with the stock photography house to see how much they charge for using their images in a multimedia presentation.

Of course, to use these discs, you need a CD-ROM drive. Two issues to consider when purchasing a CD-ROM drive are the average data transfer rate and the access times. The data transfer rate is the speed at which the information is transferred from the CD to the computer (a higher number is better). The access time is the time it takes to find the information on the CD (a lower number is better).

Microsoft's MPC standard data transfer rate of 150KB per second and access times of less than 1000 milliseconds (ms) are really too slow. NEC and Toshiba both make CD-ROM drives with data transfer rates of 300KB per second and access times

Elizabeth Wood is president of Egeland Wood & Zuber Inc. and the Electronic Publishing & Design Center (Scotia, NY, and Atlanta), specialists in developing multimedia presentations, tutorials, and interactive kiosks for clients such as AT&T and IBM. The company also provides training and consulting in multimedia technology.



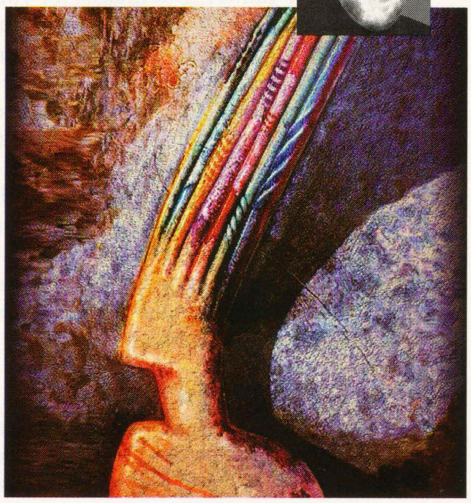
Metaphysical Abstract

"*I was trained in the traditional manner, but I think art should be a part of the times in which it's created. And today that means working with computers. In my estimation, Painter is quite simply the best paint program there is, and my work is the proof.*"

Allen Toney
Huntington, West Virginia

"*Painter actually defies physics, in that I can now do things that were previously impossible, like mixing oil and watercolors. And with PainterX2,™ the composition's never finished until I decide it is. Bottom line, if I can imagine it, Painter can image it.*"

Bill Niffenegger
Chicago, Illinois



Regalia

"THE PAINTER UNFOLDS THAT WHICH HAS NOT BEEN SEEN."

Paul Cézanne

"*Once I started working with Painter and PainterX2, everything changed. Now I'm discovering new opportunities and developing a whole new style. Of course, I don't have to settle for just one look. With Painter I can do anything my heart and mind desire.*"

Diane Fenster
Pacifica, California

Odin's Initiation

ULTIMEDIA TOOLS SERIES

FRACTAL DESIGN CORPORATION

Fractal Design Painter® 2.0. There's just no better way to unveil your true talents on a Macintosh® (including the new AV series) or a Windows™-based PC. Especially once you discover the myriad tools and textures included in this *Natural-Media®* paint application. Plus a more intuitive interface that makes Painter 2.0 easier than ever to use. To order, call Ultimedia Tools Series at **1-800-887-7771** today. And bring your genius to light with the power of Painter.

COMPUTE CHOICE AWARDS

MacUser ★★★★★

MW ★★★★

Publish ★★★★

© 1993 Fractal Design Corporation. All rights reserved. Fractal Design Painter and Natural-Media are registered trademarks, and PainterX2 is a trademark of Fractal Design Corporation. All other trademarks are the property of their respective holders.

CIRCLE 31 ON INFORMATION CARD

under 200ms. These CD-ROMs have multispeed drives that send video data at 300KB per second and slow down to 150KB for audio files. Don't settle for a CD-ROM drive with an access time slower than 300ms. Video and audio files will break up if the drive is too slow.

For easy gathering of images for your presentation, you'll also want to be sure to purchase a CD-ROM drive that can read multisession Kodak Photo CDs. Some older CD-ROM drives cannot. Kodak Photo CDs provide an easy way to put your own pictures on CD. With a multisession drive, you can have additional sessions (images) added to the original disc. If your CD-ROM drive does not read multiple sessions, you will only be able to view the first set of images placed on the disc.

Working With Video

A third way to get images into a computer is through the use of a video camera and video capture card. Video/image capture cards allow you to capture still video images from a video camera or VCR. While these cards are excellent for capturing video images, be aware that they do not offer the image quality and resolution of a scanner. Video cards come with a wide range of differentiating characteristics. But one thing to keep in mind is that, as a rule, low-cost video cards will not offer the resolution of more expensive cards.

A video signal consists of only 512 lines per screen. And because a video signal is an interlaced signal, the screen is drawn in two passes. Low-cost cards tend to capture only one field—or 256 lines—of an interlaced video signal, while the more expensive cards capture both fields, giving you the full 512 lines of resolution.

Another type of video card that you may find useful is the full-motion video card. These are cards that allow you to capture video from a camera or VCR and digitize it for playback as a movie in your multimedia application. A key point to understand here is that these cards differ from those video cards that allow you to play analog video on your computer screen but don't allow you to convert the analog video signal to a digital video signal. Thus while such cards allow your computer screen to function as a TV screen, they won't let you store and manipulate video clips.

At the moment, there are several different methods for handling video on the desktop; these include "software-only" video solutions and "hardware-assisted" video solutions.

One example of a software-only solution for video is Microsoft's Video for Windows, which manages the size of your video files by cutting resolution to 160-by-120 pixels and limiting your palette to 8 bits—or 256 colors. To work with Video for Windows, you, the author of the disc-based multimedia presentation, need a full-motion video capture card, such as SuperMac Technology's VideoSpigot ($499); the audience reading the disc just needs the Video for Windows software to play back the AVI (Audio Video Interleave) file you created. This file will play back at 15 frames per second. The quality is not as good as hardware-assisted video, but at the moment, software-only is a more easily distributed video solution.

A good example of a hardware-assisted video solution is the Intel Action Media II capture card ($495), which uses the Intel Indeo technology to capture and compress 30 frames per second (real time) at 640-by-480 resolution with 24-bit color. The compression ratio is 150:1, so the storage demands are less, and the image quality is high. On the down side, it takes a $999 decompression playback adapter to decompress the video and play it back as real-time, full-motion video. Thus distribution of these files is limited to computers with the playback adapter.

Obviously a key component of almost any multimedia presentation is sound. Some multimedia authoring programs allow you to play back existing audio without an audio card in the system. But to capture sounds, you will need an audio card. There are 8-bit and 16-bit audio cards. Which is best? What is the difference? The capabilities of the audio card determine file size and quality.

Adding Audio to the Presentation

The amount of data in each audio sample is measured in bits. Eight-bit audio is good for voice but lacks the sound quality needed for music. An audio card converts an analog signal to digital form during capture and back to an analog signal during playback. Eight-bit audio cards digitize each sound sample to one of 256 possible digital values. Sixteen-bit audio cards allow 65,000 values, which is better for music recording. These files are stored in a digital format by your audio card. Wave is the audio format for Windows audio.

The other number to be aware of when purchasing an audio board is the sampling rate of the board. The higher the sampling rate, the clearer the audio will sound. CD-quality audio is 16-bit at 44KHz. Higher fidelity requires greater storage space and a faster CPU for playback. Audio is generally recorded anywhere between 5KHz and 22KHz.

Audio cards are not always internal cards. Logitech, for example, makes a $179 AudioMan audio port adapter that plugs into your parallel port. This makes for portable sound, but you'll lose access to the printer port while using the parallel port for audio. Also, fidelity is limited with external audio port devices, and usually there are no MIDI (Musical Instrument Digital Interface) capabilities.

Audio cards such as Microsoft's Windows Sound System ($289) and Creative Labs' Sound Blaster Pro

Raster vs. Vector Graphics

Graphics software programs fall into two categories: raster and vector. When you scan an image or use a paint program to create an image, it becomes a raster graphic. Raster graphics are made up of pixels or bit maps, and the files tend to be large. Vector graphics are created with drawing programs. The drawing is stored mathematically rather than pixel by pixel. This results in a much smaller file, even for complex images.

One important thing to realize about raster images is that they get more jagged as they are scaled up in size. When you scan an image, the resulting raster image is created from a set number of pixels determined at the time of scanning. Enlarging the image does not increase the number of pixels in the image; it just spreads them across a larger space—hence, the jaggies! If you know you will need to enlarge an image, scan the image at a higher resolution or use the scanner's software to enlarge it during scanning.

As for vector objects, they are made up of points and lines. The vector-based objects you draw can be moved, rearranged, or reordered on top of one another. Unlike in a raster graphics file, in a vector file unlimited layers are created by the drawn objects.

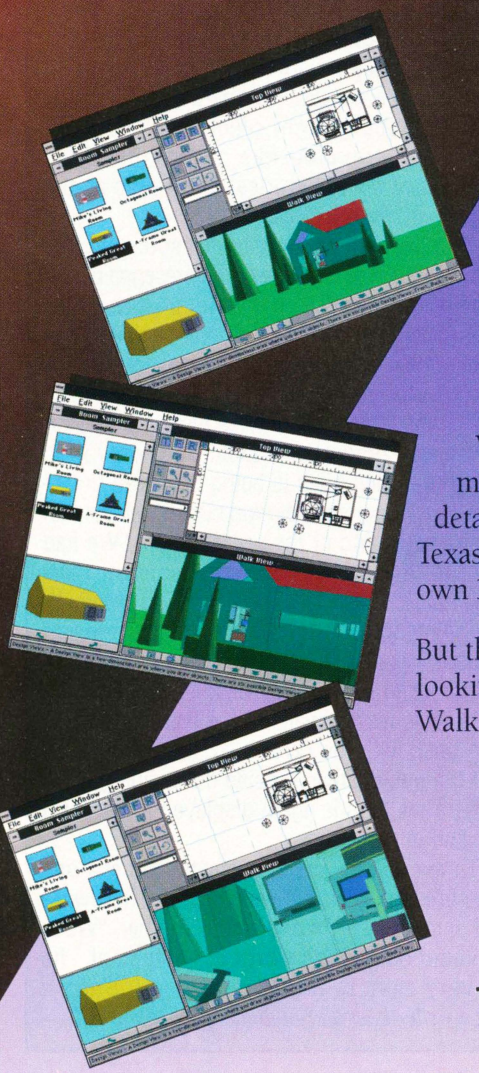
Images created with drawing programs are more flexible and easier to edit than raster images. You can size or scale a vector graphic and the resolution will always remain at the maximum resolution of the display device. You'll never get jaggies. *—EW*

VIRTUAL REALITY

Is Now A Desktop Reality

VIRTUS for Windows
WALKTHROUGH®
3D DRAWING AND VISUALIZATION

VIRTUS VR™
virtual reality for the desktop



You've heard about the mind-bending world of Virtual Reality. Now, ***experience*** it with Virtus WalkThrough for Windows and Virtus VR. Bring the excitement of real-time 3D imaging to your desktop computer.

Using Virtus WalkThrough you can create worlds of reality with just a click of your mouse. Build interactive environments with the latest in 3D technology. Build your home or office or a dream world—and change it at will.

With Virtus VR, you don't just view a scene—you ***walk through*** it. You can manipulate objects. Move freely above, below, around, and inside a variety of detailed three-dimensional "galleries". Walk through the White House. View the Texas School Book Depository and peer down on Dealey Plaza. Or create your own 3D worlds with simple "drag and drop" tools.

But these two products are too cool for words—you have to ***try*** it. If you're looking for a way to get into Virtual Reality from your desktop, Virtus WalkThrough and Virtus VR unlocks the door.

Virtus Corporation
1-800-847-8871

ULTIMEDIA TOOLS SERIES

IBM® ULTIMEDIA® TOOLS SERIES™
ONE STOP MULTIMEDIA SHOP™
CALL 1-800-887-7771

VIRTUS

Virtus WalkThrough and Virtus VR are available for both Windows and Macintosh.

CIRCLE 32 ON INFORMATION CARD

Deluxe ($199) have more capabilities than audio port devices. Look for an audio card that gives you at minimum a microphone jack, RCA output jacks for both headphones and stereo, and a MIDI port. Look also to get an audio card that has a SCSI (Small Computer Systems Interface) connection so that you will be able to attach a CD-ROM drive without installing yet another card into your system. Media Vision's Pro Audio Spectrum card ($395) is an example of a SCSI-equipped audio card.

To truly understand audio, you need to be aware that there are three ways to record sound or music with a computer: synthesizing, digitizing, and using MIDI.

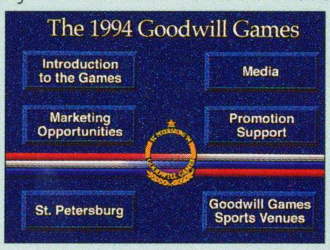
Synthesized effects are created by modulating a waveform like a sine wave to produce unique sounds. The results range from simple little ditties to sophisticated music. But producing sound in this fashion is extremely difficult, if not impossible, for programmers who don't have musical backgrounds.

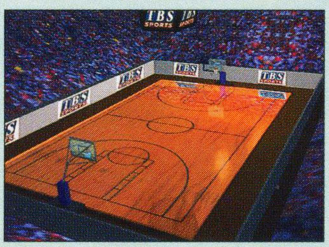
Digitized sound is the type of sound found on a compact disc. Digitized sounds are created by recording actual voice and musical signals to the computer's hard disk at some fixed sampling rate. It is similar to using a tape recorder. The advantage of digitized sound is that you can simply record

Multimedia Sells Sponsorships for the Goodwill Games

When Atlanta-based Turner Broadcasting set out early last year to line up sponsors for the 1994 Goodwill Games, the company recognized that something special would probably be needed. After all, ratings for the 1986 and 1990 Games had been somewhat lackluster. To attract advertisers to next year's event, recalls a Turner spokesperson in New York, "We wanted to give them an idea of the 'feel' of the Games. Multimedia is a good way to do that—it's much more effective than to have them look at a piece of paper."

Today, prospective sponsors of the Games—a 16-day international athletic event scheduled to take place July 1994 in St. Petersburg, Russia—are given a slick sight-and-sound sales pitch that can be instantly tailored to any of the 50 or so advertisers Turner has targeted. Prepared by the Whitley Group Inc., a four-year-old, multimedia development company based in Charlotte, North Carolina, the presentation features an interactive main menu that is used to call up video scenes of previous Goodwill Games, tours of St. Petersburg (sometimes called "The Venice of the North"), still images, computer-generated animations, and details on such key advertiser issues as promotion support, media tie-ins, marketing opportunities, licensing and merchandising strategies, and market-share projections.





So far, says the Turner source, the 30- to 60-minute presentation has persuaded five sponsors (including Pepsi, Reebok, and Delta Airlines) to sign up for the Games, reportedly for about $6 million each. Turner Broadcasting, which owns the production rights to the Goodwill Games, is seeking to sign up at least four or five more major advertisers for the event.

In a way, the presentation came about almost by accident, recalls Eddie Thompson, the Whitley Group's project manager. Most of the company's previous capabilities had focused on museum and visitor-center kiosks, sales presentations, and interactive displays for trade shows. It was only after Whitley's Atlanta salesperson had tried (unsuccessfully) to sell Turner Broadcasting on another type of presentation that the media giant itself suggested a portable, self-contained sales tool for attracting sponsors to the Goodwill Games. Whitley began the four-month-long development process in March 1992.

The presentation was designed on a Macintosh IIci equipped with a 300MB hard drive and 20MB of RAM, according to Thompson. Commercial software included Macromedia Director as the authoring tool, SoundEdit Pro for digitizing the audio, Stratavision 3D and "one or two" other 3D packages for 3D modeling needs, and Adobe Photoshop for touching up the graphics. Display of the presentation requires a Mac IIci, a laser disk player, Bose portable speakers, and a Sharp LCD projector that generates an 8-by-10-foot image.

Much of the presentation—which is actually several different "movies" stored on the hard drive—is based on fairly conventional interactive techniques. By clicking onto "The Goodwill Games" from the main menu, for example, the screen dissolves into color video excerpts from previous Games, narrated by actor James Earl Jones. Clicking on "St. Petersburg" is followed by video scenes of the city, also narrated by Jones. Another selection brings up a computer-generated 3D map of St. Petersburg, from which the viewer can summon travelog-like audio and video scenes of such historical landmarks as the Peter and Paul Fortress.

For Turner and its potential sponsors, the most appealing features of the presentation are the custom-tailored computer images of the Kirov Stadium, the Lenin Sports Complex, and other 1994 competition sites selected from the computerized birds-eye view of the city. (Thompson notes that these particular illustrations were produced by another company.)

If the sales pitch is being delivered to Coca-Cola, for example, the Turner salesperson simply selects that sponsor's name at the beginning of the presentation. "We had to make it easy to use for non-technical presenters," says Thompson. Once the name is selected, the Coke logo automatically appears at key points throughout the presentation—a feature that required about 7MB of disk space for each of the 50 or so sponsors. Coke marketing representatives then "fly" into various buildings, where they see the walls of the basketball court or other facility festooned with the Coke logo; later sequences depict color stills of the public areas outside the building, coupled with sound, where the logo is again displayed in the form of banners, posters, and other things.

So far, says the Turner source, the broadcaster has just one complaint about the presentation: the weight of the hardware that must be hauled or shipped from one site to another. "We're now working with about 60 pounds worth of equipment," he says. "That isn't very easy to lug around."—*H. Garrett DeYoung, a freelance writer based in Scituate, Massachusetts.*

ULTIMEDIA TOOLS SERIES (UTS) MAKES MULTIMEDIA WORK FOR YOU

Gilbert and Sullivan, Fred and Ginger, UTS and You.

Sight..sound...action...interaction! With the help of IBM's Ultimedia Tools Series (UTS), your creativity can rival the greatest partnerships of stage or screen – whatever role multimedia plays for you.

For developers, UTS provides a wide range of over 80 software tools and associated hardware that work in harmony – making it easy and more affordable to create applications.

For authors of multimedia productions, UTS eliminates cumbersome moves. Now you can make your ideas *dance* in OS/2, DOS or Windows using audio and video effects so seamless, so subtle, that the silver screen's finest choreographers would love to steal from your score.

You can audition all of the UTS software products with the UTS SAMPLER CD. For just 9^{95}, you get demonstrations and tutorials showing how the UTS environment lets your creativity perform to the tune of its choice. To order, call **1-800-UTS-7771, ext. 551.**
OR SEND IN THIS COUPON ➪

FOR THE ENTIRE SCORE ON UTS, MAIL THIS COUPON TODAY!

❑ YES! Please send me the UTS SAMPLER CD
Send your check or credit card details to:
IBM Ultimedia Tools Series,
1055 Joaquin Road, Mountain View CA 94043.

❑ Enclosed is my check
❑ Visa ❑ Mastercard ❑ American Express

Card Number_____ Exp. Date_____

Signature_____

UTS SAMPLER CD	$9.95
Local Sales Tax: (If tax-exempt, please supply your I.D. no.)	_____
Shipping	$1.50
Total:	_____

Name_____

Title_____

Company_____

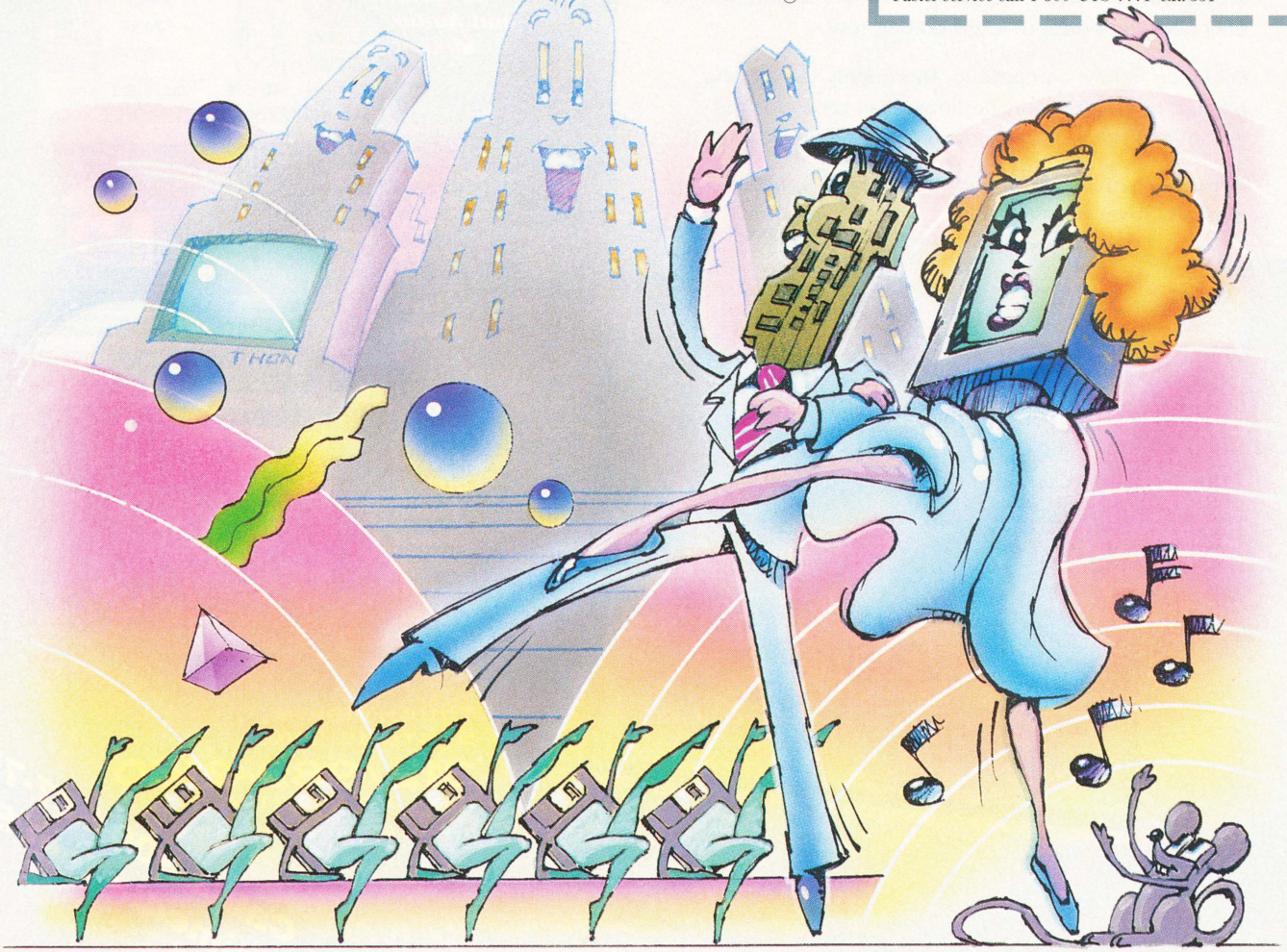
Address_____

City_____ State____ Zip_____

Telephone____ /_____

Faster service call 1-800-UTS-7771 ext. 551

IBM®



©1993 IBM Corp. All Rights Reserved

CIRCLE 32 ON INFORMATION CARD

Turn Your PC into a *Complete* Video Production Studio

D/Vision®

VERSION 2.1

Now there's an easy way to produce edited videotapes and multimedia video: Use your personal computer and a software package called D/Vision. Introducing D/Vision Version 2.1 using Intel's i750/Indeo digital video board...

The Digital Advantages:
Speed, Simplicity, Low Cost

D/Vision uses Intel's i750 ActionMedia board to digitize material from a VCR onto your PC. Then you can "cut and paste" video like words in a word processor. And because D/Vision is truly "non-linear", you instantly see your edited program. No waiting for tapes to cue or a digital video file to be built. D/Vision has a simple user interface. Gone are complicated suites and expensive equipment. Everything is done on your PC.

SuperRTV™:
Digital Video with True Videotape Quality

Unlike other digital video software, D/Vision gives you true videotape picture quality. SupeRTV, an enhancement of Intel's RTV (Real Time Video), lets you "print" high quality, full-screen video directly to videotape.

One Tool, Many Uses

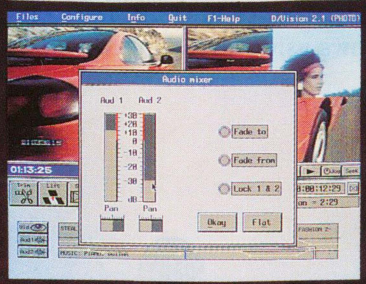
D/Vision also outputs "Video for Windows" and Quicktime digital video files. Or a clean SMPTE time-coded Edit Decision List. So whether you're producing broadcast television, desktop video or multimedia, you only need one easy-to-learn editing tool.

D/Vision is IBM compatible, thoroughly tested and backed by two support hotlines. Call today for the authorized dealer nearest you or a free Demo Disk.

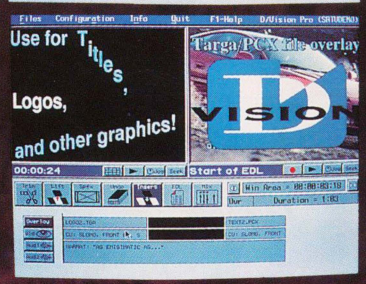
Produce edited videotapes and multimedia digital video on your PC.

True "Non-Linear", Random Access Editing

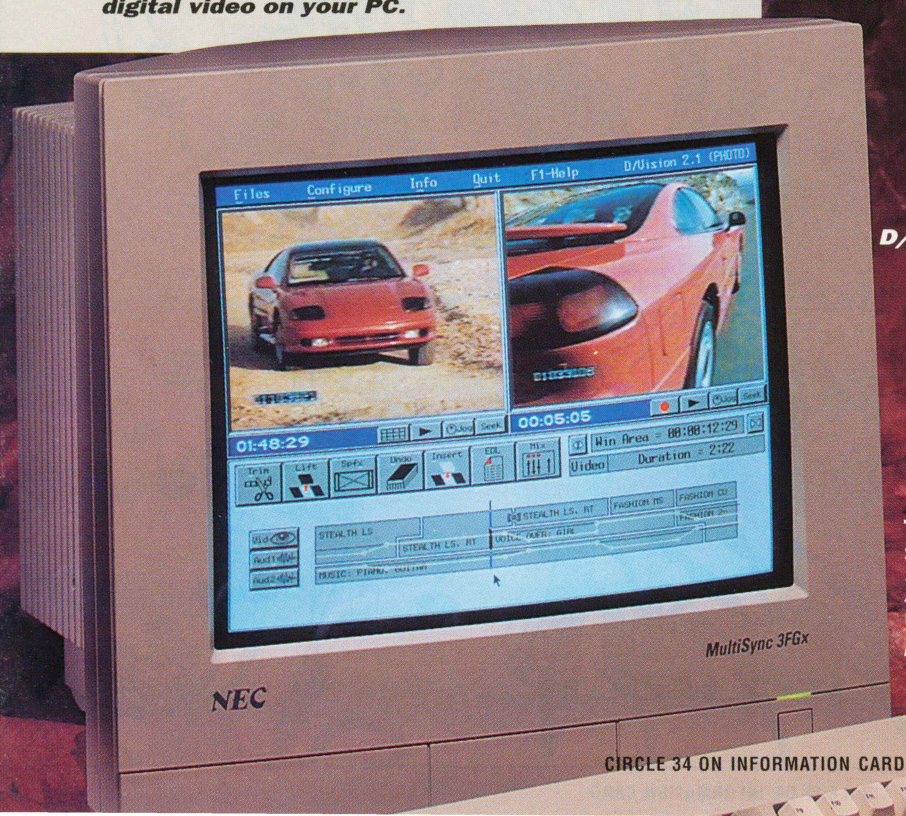
Special Effects and Audio Mixing



Overlay Targa/ PCX Files on Live Video



D/Vision and Intel's Video Board are All You Need



TOUCHVISION SYSTEMS, INC.

312/989-2160

FAX: 312/989-2144

D/Vision $495; D/Vision Pro $3950

Call 1-800-887-7771
Ultimedia Tool Series

CIRCLE 34 ON INFORMATION CARD

whatever you want. The downside is that playback is memory-intensive and makes large demands on the CPU.

MIDI is a standard format for recording, storing, and playing digital music. A MIDI interface on your audio card allows you to attach to your computer MIDI musical instruments such as MIDI keyboards or MIDI drums.

MIDI files take up far less space than digitized sound samples. They put minimal demands on the computer's CPU and, therefore, do not slow down animations and transitions in a multimedia application. Does that mean MIDI is the best solution for you? Well, probably not, because few users own MIDI devices. But if you do choose to use MIDI, you should know that MIDI music clips are available from on-line services like CompuServe as well as a variety of other vendors.

The Software Choices

In addition to making all these hardware decisions, you will also need to decide what kind of software you want in your multimedia system. If hardware is the muscle behind multimedia, then software is the brains.

The good news for PC users is that the latest release of Microsoft Windows (Version 3.1) includes some limited multimedia software capabilities. These tools include Paintbrush for image creation and editing, Media Player to play animations and sounds, and Sound Recorder to capture audio (if you have an audio card).

These are not high-end editing tools, but they'll get you started. However, if you're really serious about multimedia and want to create high-quality presentations, you will need tools far more powerful than these.

Of course, the number of tools you will need will vary depending on just what kind of presentation you want to create. But the range of tools you'll have to choose from is enormous.

First there are the graphics programs. At minimum, you'll probably need a basic painting and drawing program that will permit you to create lines, shapes, and illustrations and work with color. Image-editing programs (such as Adobe Photoshop, Aldus PhotoStyler, or Micrografx Picture Publisher) will be useful for higher-end image-editing tasks, creating polished artwork, and applying special filter effects to photos. And, finally, animation programs will be essential for adding motion to your imagery and professional-level quality to your presenta-

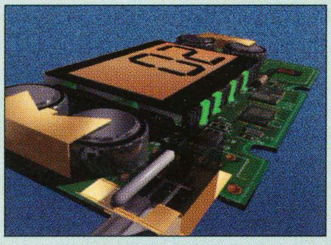
Grabbing Attention on the Trade Show Floor

When MediSense, a manufacturer of sophisticated biosensor technology systems such as blood glucose monitors for diabetics, set out to attend a recent trade show for the American Diabetes Association, it anticipated running up against a competitor in its particular field for the first time.

As a result, the company felt the need to develop a persuasive enticement to get trade show attendees to enter its booth for the full competitive story from its personnel. To fill that need, the company turned to Planet Enteractive (Boston), a multimedia production house. According to Glenn Johanson of Planet Enteractive, MediSense not only needed something that would attract people to its booth, it also "needed something that exuded mastery over cutting-edge technology."

What could be better than a "video" with the high-definition, CAD-like look of computer animation?

The multimedia presentation that Planet Enteractive eventually developed for MediSense contained two parts. The first is a 90-second demo of a new product for diabetics; the second is an interactive medical-trivia quiz for show-goers. The quiz even has the ability to loop back to the "canned" presentation.



The program shows how biosensor technology works by using animated renderings of the glucose monitor itself, along with assorted "camera" moves around and through the subjects on screen.

Working on Macintoshes, Johanson says his company relied on two different software programs for the 3D renderings—Infini-D from Specular International and Ashlar Vellum from Ashlar. "Infini-D does a great job of rendering textures and lighting," says Johanson, "and it has the best abilities to set the in and out points [of sequences], but Ashlar Vellum allows much more precise control in the modeling.

"We developed a custom color palette for the program to get the best 256 colors we could," Johanson continues, "but we had mysterious problems using QuickKeys—an odd palette would appear at arbitrary points. We turned to DeBabelizer from Equilibrium Technologies, with its automatic batch-processing. It went through the files and optimized the palette, converting all the files in the folder. We also needed to add a consistent background, which DeBabelizer attended to."

Like the graphics rendering itself, the animation sequences were produced with a variety of different software. Where it was appropriate, says Johanson, "We used PACo Producer for animated sequences because it changes only the pixels that vary within the sequences [keeping file size down]; but Macromedia Director is great for calling the sequences as well as calling audio segments. Infini-D is outstanding for creating the time sequences, but doesn't have the modeling precision of Vellum."

Adobe Premiere, with its collection of special effects, was added to the list of resources for both artistic and logistical reasons. "There wasn't enough time in the final soundtrack to do planned camera moves, so we used Premiere to dissolve between sequences," says Johanson. "CoSA AfterEffects was used for a cross-fade and dolly-out."

The clean imagery and the smooth animated movements—a very high-tech, CAD-like look, indeed—gave the program the ambiance required for its cutting-edge client. It also taxed the abilities of the various Quadra computers used in the production. "In the future," says Johanson, "an SGI or similar platform would be preferable, because it would have rendered a lot faster and the whole project would have consumed far fewer man-hours."

Wouldn't there be further man-hours saved if conventional NTSC video animation systems had been used? Maybe. But then, says Johanson, the interactive quiz which loops back into the main presentation would not be feasible. Neither would the super-sharp, rich color images of high-resolution RGB computer output—already the equal of what the public calls "high-definition TV."—*Don Sutherland, a freelance writer based in Staten Island, New York.*

tion. Animations can go a long way to really capturing the attention of your audience.

Animations can be simple or sophisticated. They range from a simple path-based animation, such as type scrolling across the screen, to a photorealistic 3D rendering for a virtual reality fly-through of an office building. Choosing a 2D or 3D animation package can be a challenge, since there are quite a few on the market and they each offer a wide range of diverse features. Users will need to examine the choices carefully to determine which ones best meet their needs.

One of the leading vendors of animation programs that is worthy of a specific mention is Autodesk, which offers a 2D program, Autodesk Animator Pro, and a 3D program, 3D Studio. Not only are both excellent packages, but the flic file format (FLC and FLI) that Animator creates is the standard animation file format used by most multimedia authoring programs.

In addition to these graphics programs, multimedia users may also find it useful to purchase a video-editing software package that will allow you to edit video clips, integrate sound with video, and just generally create short movies on the desktop. These tools can't produce broadcast-quality video, but nevertheless, their ability to incorporate video into a multimedia application can be useful and effective when used appropriately. While there are several programs on the market claiming varying degrees of video-editing capability, the clear leader to date in this product category is Premiere from Adobe Systems.

Authoring Software at the Low End

Another group of tools necessary for creating multimedia presentations can be roughly categorized under the heading of authoring software. Multimedia authoring software acts as the integrator of the varied types of data. The authoring software is where all the individual files from many programs are merged.

Once again, there are many kinds of

NationsBank Trains Employees and Woos Clients With Interactive Disks

On December 31, 1991, Atlanta-based NationsBank merged with NCNB Corp. and C&S/Sovran Corp., creating a single large entity with more than 1800 offices nationwide.

One of the challenges that faced NationsBank after the merger was to educate both the new customer base and new employees on the complicated business of import and export factoring, a specialty of NationsBank. Briefly stated, factoring involves one party (NationsBank) providing working capital to another party (usually manufacturers) as an advance on receivables.

Eyeing "tremendous opportunity to improve revenue," the company plotted out some goals to instruct its employees and help nuture its growth. As it turned out, PC disk-based interactive multimedia proved the ideal vehicle to help achieve those goals.

An interactive multimedia diskette proved to be an easy-to-understand medium for explaining international factoring to US manufacturing firms and foreign correspondent banks. The electronic media also proved to be an inexpensive means of distributing the information.

Besides explaining factoring to new employees and customers, the new entity had to re-establish its reputation as a factoring industry leader. To do that, NationsBank contracted a local software consulting and development firm, Dynamic Media Inc., to create a program called ExportEdge. The idea was to provide visual, animated presentations that promote the company's expertise and experience in international factoring.

"We worked with the head of both advertising and factoring in Atlanta," says Gary White, president of Dynamic Media. "As we got started, we had two decisions to make: What platforms do we want to support, and what look and feel do we want?"

Citing the need to support the DOS/Windows PC platform, which was widely installed within the bank, Dynamic Media created the application using IBM's Storyboard Live! running on a PC. The developers chose to support EGA graphics, which at a screen resolution of 640-by-350 pixels and 4-bit color, can update the screen quickly enough on a '386-based machine to keep animations moving, says White.

"The main challenges anyone has [in multimedia development] are timing and speed," he says. "Because we're running it off a floppy or hard disk, we wanted it to have consistency throughout the presentation and keep the momentum going ... to make sure that it's doing something. Even though sometimes the software may only be writing text on the screen, we have to keep the animation going. That way, there's never a blank screen.

"The whole process of factoring is animated," continues White. "Animated invoices are [flying around], animated crates land on desks. The crates are shown being shipped, and at one point they start piling up, then later animated money comes back to the user."

In another section of the presentation, a user can hit a key or choose a menu option that brings up a colorful map that illustrates locations of branches and major facilities that make up the new NationsBank. An animated "starburst effect" occurs over a bank locale, and users can access telephone numbers and addresses for branches.

Many animations are part of Dynamic Media's DesignPro software, which contains a library of "animated bullets," says White. The final NationsBank presentation relies heavily on the animated highlights taken from the program.

Using a Microtek scanner, Dynamic Media imported color images of banks, paper money, various photographs, and text. Some of the material had to be dithered down from the 8-bit images produced by the scanner to appear clearly on the EGA monitor, says White.

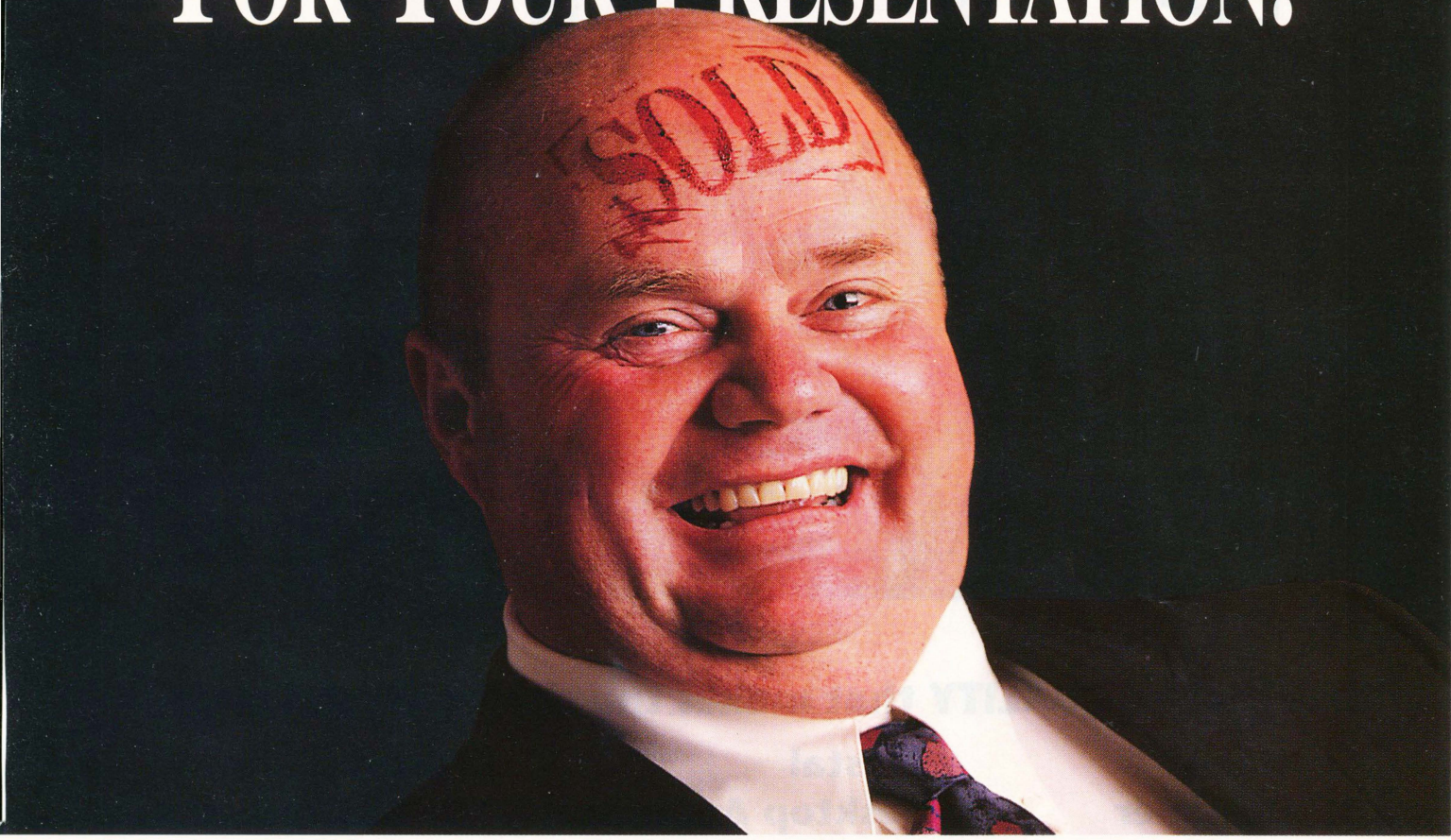
There were some hardware considerations, he adds. "We had to go for the lowest common denominator as far as hardware is concerned: We recommend a '386 with 4MB of RAM. It will run on a '286, however."

He also stated that they wanted to make the presentation available on laptops and portables, hence the need to fit it on a 1.4MB diskette.

Not only does the one-diskette presentation teach bank employees the fine points of factoring, it can help new salespeople effectively win over customers "like a veteran," according to the bank. Also, trainees no longer have to take notes, for information comes electronically on diskette.

One benefit of the ExportEdge software program is at NationsBank's bottom line: The international factoring division doubled revenue during 1992 and increased its overseas business. The company attributes a lot of that business to the software, which has allowed it to differentiate itself from the competition in the eyes of its foreign customers, who have increasingly chosen NationsBank as their US correspondent.—*John Webster, a freelance writer based in San Francisco.*

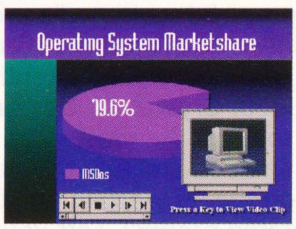
WHAT Q/MEDIA™ DOES FOR YOUR PRESENTATION.



Never make an ordinary presentation again!

With award winning Q/Media™ For Windows you'll have the power of multimedia at your fingertips. Presentations, training and teaching materials, and reports will leap out and grab your audience with the persuasive power of stunning graphics, brilliant video, thrilling sound, and exciting animation.

Q/Media For Windows makes it WYSIWYG-easy to assemble and synchronize audio files, video clips, animation, and graphics files. Drag and drop them where you want them; move or size them with the click of a mouse. Along with supporting 20 separate file formats you can add slides from programs like Harvard Graphics™, Lotus Freelance™, CorelDraw™, or Microsoft®PowerPoint™. We even include 10MB of clip media to get you started.



Simply drag and drop files onto the screen.

Synchronize your objects along the timeline with your mouse.

Now anybody can be making their first stunning multimedia presentation in as little as 15 minutes. No file conversions, no programming, no scripting, no special training, no expensive hardware needed.

Call **1-800-887-7771** and order Q/Media For Windows today. It's only **$99.00**. Try it for up to 60 days without risk and *you'll* be sold. We guarantee it.

Multimedia Presentations For Windows

A product of Q/Media Software Corporation.
312 East 5th Avenue, Vancouver, B.C., V5T 1H4, Canada
(604) 879-1190 • (800) 444-9356 • FAX (604) 879-0214

Trademarks mentioned are the property of their respective owners.

SYSTEM REQUIREMENTS: • Microsoft Windows 3.1 • Windows compatible VGA or Super VGA graphics adapter card • IBM Compatible with 386 or higher • 4MB RAM memory or higher • Windows compatible mouse or other pointing device. Sound card recommended. **FILE FORMATS SUPPORTED:** Video/AVI, AVS. Animation/FLC, FLI, MMM, AWI. Sound/WAV, MIDI, CD Audio. Graphics/BMP, WMF, TIF, GIF, PCX, EPS, DIB, TGA, JPG, WPG, DXF, PICT.

CIRCLE 35 ON INFORMATION CARD

Fun to drive and easy to handle...

Model of Porsche provided by Viewpoint Animation Engineering

but it's the QUALITY that makes the choice Crystal clear.

Crystal 3D Designer

For cutting-edge artists, designers and illustrators who want to be free from the creative limitations of 2D (flat) illustration tools. It features intuitive spline surface modeling tools and fast photorealistic rendering. You can import PostScript fonts, most common picture file formats, DXF and Illustrator 88 (EPS) artwork. Export high-resolution 24-bit EPS, TGA and TIFF picture files with alpha channels. Popular Super VGA graphics cards supported.

Crystal Desktop Animator

This powerful multimedia product provides all the intuitive 3D modeling and photorealistic rendering abilities of **Crystal 3D Designer— plus** some of the most sophisticated animation creation tools available on the PC — all in one fully integrated product. Lets you create high-quality 8-bit digital video (FLC) animations — to make your presentations more exciting ... your simulations more realistic ... and your multimedia training more captivating.

Crystal TOPAS Professional

CrystalGraphics' flagship product — a fully integrated broadcast-quality 3D animation package. Includes all the capabilities of **Crystal Desktop Animator — plus** additional features to generate broadcast-quality animations — frame-by-frame 32-bit animation output (up to 8K x 8K), field rendering, NTSC/PAL color correction, traveling mattes, rotoscoping and VTR control. Supports Truevision and Matrox video graphics boards.

Choose the one that's right for you.

3110 Patrick Henry Drive
Santa Clara, CA 95054
(408) 496-6175
fax (408) 496-6988

CrystalGraphics

For product or reseller information, call

1-800-394-0700

617-229-6900 (International)

Ask about our video tape offer!

30 day money-back guarantee.
Free technical support from CrystalGraphics, Inc.

CrystalGraphics, Crystal 3D Designer, Crystal Desktop Animator, TOPAS and Crystal TOPAS Professional are trademarks of CrystalGraphics, Inc. All other copyrights, trademarks and trade names are the property of their respective owners.

authoring programs on the market for multimedia, and the choices can be overwhelming. If you're really serious, you'll need a dedicated authoring program, maybe one using programming commands or a scripting language. But if your needs are not that sophisticated, even word processors and slide presentation programs can be used as simple multimedia authoring tools.

While you may balk at the idea of calling a word processing package an authoring program, the fact is that if you are just getting started and don't want to invest a lot of money in software, you can do some basic authoring in a Windows word processor such as Microsoft Word. Word allows you to embed audio, video, and animation objects right into your word processing file by using Object Linking and Embedding (OLE) technology. Each page becomes a slide, and by clicking on an object, the user can hear audio or see an animation. An ordinary letter becomes an interactive presentation when a video clip is embedded. With a word processing program, multimedia presentations for small groups can be run from your desktop computer's monitor.

To try this approach to multimedia, just take your favorite word processor and set your page size and margins to match your monitor. Use tags or styles to keep a consistent look in your slides. One page equals one slide. Add graphics and embed audio, video, and animation files. Use the "page down" command to move from slide to slide. Click on the sound- or video-embedded object to bring your presentation to life. Handouts are easily generated by printing the presentation.

When you're ready to step up from a word processing program, you'll probably want to step into one of the popular slide presentation programs such as Aldus Persuasion, Lotus Freelance Plus, Microsoft PowerPoint, or Harvard Graphics from Software Publishing Corporation. In addition to offering extensive charting features, some image drawing capabilities, and select special effects, such as dissolves and wipes, these packages, when used on the PC, can take advantage of OLE to embed audio, video, and animation files into your presentations.

Dedicated Authoring Software

Dedicated authoring programs can be broken into three general classes: entry level, mid range, and high end. At the entry level, you have programs such as Macromedia Action!, Asymetrix's Compel, Super Show and Tell from AskMe 2000, and CorelShow from Corel.

More sophisticated than the slide presentation programs, these entry-level programs will let you generate animated slides, add motion to text and images, and create self-running and interactive presentations. Prices for these programs hover in the $100 to $500 range.

At the mid range, you have programs such as Animation Works Interactive from Gold Disk, Macromedia Director, HSC Interactive, and Passport Producer from Passport Designs. Prices for these packages can vary, with Animation Works Interactive costing about $495 and Passport Producer costing $1495.

The difference between entry-level and mid-range authoring programs lies in the way you approach the presentation. Programs like Macromedia Action! and CorelShow take a slide show approach to creating a presentation. The mid-range programs provide more tools for creating animated actors and backgrounds and for creating applications with branching structures for increased interactivity. Of all the mid-range programs, Animation Works Interactive is one of the easiest to use.

The high end of the dedicated authoring system product category is characterized by programs such as IconAuthor from AimTech Corp., Multimedia ToolBook from Asymetrix, and Authorware Professional

OS/2: The Multimedia Operating System of the Future?

In the battle for operating system dominance, IBM's hope is to establish OS/2 as the premier environment for the creation and delivery of multimedia. Given that it is the only operating system built from the ground up with multimedia built in, it just may happen.

Why? Because multimedia applications cannot tolerate processing delays without significant loss in the quality of the presentation. A multimedia operating system must provide superior and seemingly dedicated throughput while at the same time remain responsive to interactive applications. The OS/2 operating system maximizes the allocation of its resources and delivers an ideal multimedia environment.

The OS/2 operating system supports DOS and Windows applications as well as OS/2 applications and has multimedia extensions (MMPM/2) already built in. MMPM/2 provides an exciting array of multimedia applications, including a Compact Disc Player feature for compact disc audio, a waveform editor, and a movie player.

OS/2's Compact Disc Player feature provides the means to play music CDs from your computer. The Compact Disc Player uses familiar CD player buttons to let you change the order in which tracks are played.

OS/2's digital audio looks like a simple player/recorder but it also includes a powerful waveform editor. Simple cut-and-paste operations allow you to edit audio from a graphical representation of the sound wave. Audio special effects such as volume and speed adjustments, fade-in and fade-out, reverb, reverse, and echo can alter sounds.

OS/2's digital video is four times the resolution of typical software-only video. Depending on the performance of your computer, OS/2's Ultimotion compression algorithm can yield up to 30 frames per second or resolutions up to 640 by 480. Digital video can play back on any system with OS/2 2.1; no unique hardware is required.

OS/2 version 2.1 also has a 32-bit graphics engine that gives the multimedia developer a palette of 16 million colors to choose from—eliminating the need to convert palettes to avoid palette shifts. The operating system also includes the Multimedia Presentation Manager Toolkit/2, so product developers can increase their productivity with sample code, useful tools, and fully documented sample programs.

Complementing all this power in the operating system is the fact that IBM's Personal Software Products (PSP) division has recently released three new software products for the OS/2 2.1 operating system. Ultimedia Builder/2 is an OS/2 multimedia authoring program with an easy-to-use "light table" interface. On the light table, you rearrange audio files, video files, text, and images to create your presentation. Ultimedia Perfect Image/2 is a raster image processing program. The Ultimedia Workplace/2 links multimedia information and databases. These three products make up the Ultimedia Tools Series.

At the moment, sales for OS/2 are on the rise. And if this robust operating system eventually does come to dominate the marketplace, the cause of multimedia will be well served.—*EW*

from Macromedia.

Sophisticated multimedia authoring programs are complex packages that require more dedication to learn and use. They have their own scripting language. One of the advantages these programs offer, however, is sophisticated tools for creating links to databases and for tracking input from users—a capability useful for things such as training applications. While not necessary for many multimedia users, these programs can be a worthwhile investment for a large corporation with a dedicated presentation staff or for users producing particularly sophisticated multimedia applications. Given the level of complexity offered, prices for these programs can get fairly high. Authorware Professional, for example, has a suggested retail price of $4995.

Delivery System Considerations

As you set out to choose an authoring system, the one thing to keep in mind is this: If you're putting your presentations onto disk so you can send them to customers or colleagues, be sure you pick an authoring system that will allow your audience to play your presentation.

If you create a presentation using a Windows multimedia application, the receiver will need to have Windows. If you create your presentation with an OS/2 or Macintosh multimedia application, the receiver will need those systems to play it back in most cases. (Some Macintosh applications run under Windows on a PC.)

Likewise, some multimedia applications can deliver sound to a system without a sound card, and some can't. It would be a shame to mail out demo disks with audio that explains product features, only to find out the receiver of the disk can't hear them on his or her computer.

Since the fact remains that DOS is still the most common system in use today, many people may find that what they really need is a DOS-based authoring program.

One example of such a program is IBM Storyboard Live!, an inexpensive ($249) entry-level authoring program that includes audio- and video-capture capabilities (if you have the hardware). The program comes complete with sound files, clip art, and a paint module to create your own graphics. Presentations you distribute with the Storyteller module will play on any computer with a VGA monitor, even without special audio or video cards.

On the higher end are more complex programs such as Grasp from Paul Mace Software and Quest from Allen Communications, which allow you to author in the DOS environment and link to databases.

Utility Software

One final category of software programs worth mentioning is utility programs. This class of software includes things like screen-capture utilities and file-conversion options. These can be essential tools when creating a multimedia presentation. There's nothing worse than having a great photo stored in a format not supported by your authoring program.

A good utility program will allow you to convert from one file format to another with the click of a button—a necessary tool for multimedia because your files will be coming from many different programs.

Some utility programs, like HSC ImagePrep, reduce colors in an image or convert images to the same palette. This is useful because your computer display can only show a limited number of colors on the screen at one time—16 colors on a VGA display, 256 on an SVGA. If you have a photo that is mostly red, the photo is saved with a palette of 256 shades of red. If you then overlay a photo that uses 256 shades of blue, weird colors will flash across your screen while the red shades map out to the new palette of the blue image. The way to avoid this psychedelic palette shift is to use your utility program to convert the images to one unified palette.

Many high-end image processing programs, like Adobe Photoshop and Aldus PhotoStyler, include capabilities to convert graphics file formats, reduce colors, or save a custom palette.

The Bottom Line is the Message

So there you have it: the beginner's guide to understanding multimedia. For the person just getting his or her feet wet in all this, there's a lot to think about and a lot of technology to absorb. Clearly, tackling a multimedia presentation or other application is a technologically intensive undertaking.

But as you start out on that journey, the one thing to keep in mind is that no matter what type of multimedia presentation you are creating, you must never forget the message. Use good, clean design for all your visuals, and make sure your graphics add to your point and don't detract from it.

Have fun with multimedia. Experiment. Use the technology to add excitement to your presentations. Grab your audience's attention and distinguish yourself from your competition.

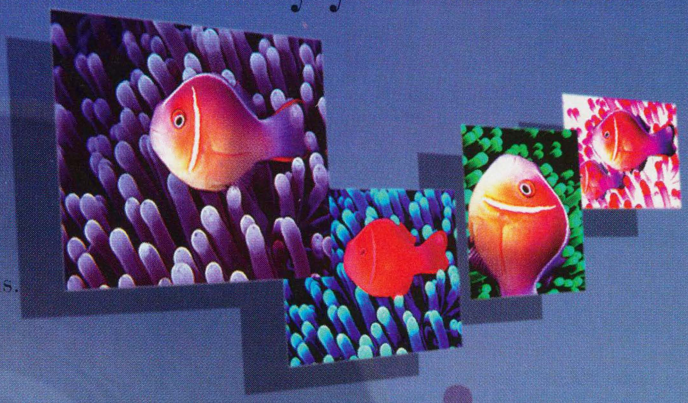
But always remember that multimedia is a double-edged sword. It can enlighten, but it can also confuse. It can entertain, but it can also frustrate. The key is to always use the technology to enhance your message. Never let the message get lost in the technology. *CGW*

Tips to Keep in Mind

- Don't forget to budget for training. You'll save a LOT of time in the long run. One hour of training replaces eight hours of muddling through on your own. A good rule of thumb for training: The cost of Hardware + Software = Training Cost.
- Don't forget to budget for software updates and new programs. These are hidden costs that can't be avoided. You'll find a domino effect when you upgrade one product. You'll need to upgrade other products to keep them working together.
- Don't use colors that are close to the same brightness value or they will vibrate. Example: red and blue.
- Do use colors with high contrast: yellow on black, light blue on black.
- Keep file size in mind when selecting a desktop video solution. A 640-by-480-pixel display with a 24-bit color palette requires almost one megabyte of storage per frame of video. At 30 frames of video per second, one second of video demands a whopping 30MB of hard-disk space! To cut down on the file size, your choices include cutting resolution, reducing colors, or using hardware-assisted compression/decompression techniques.
- The resolution of your computer screen is less than 100 dpi. When preparing raster graphics for multimedia applications, make the resolution of the graphic match the resolution of your screen. A 300dpi image will not appear any better than one at 100 dpi. The extra information will only slow down your application. Save your high-resolution scanning for print-media applications.—*EW*

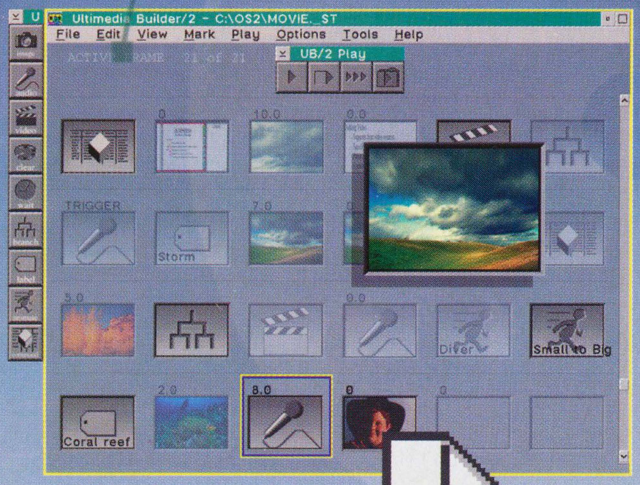
3 Easy Pieces

make multimedia so easy, you'll wonder why you waited...



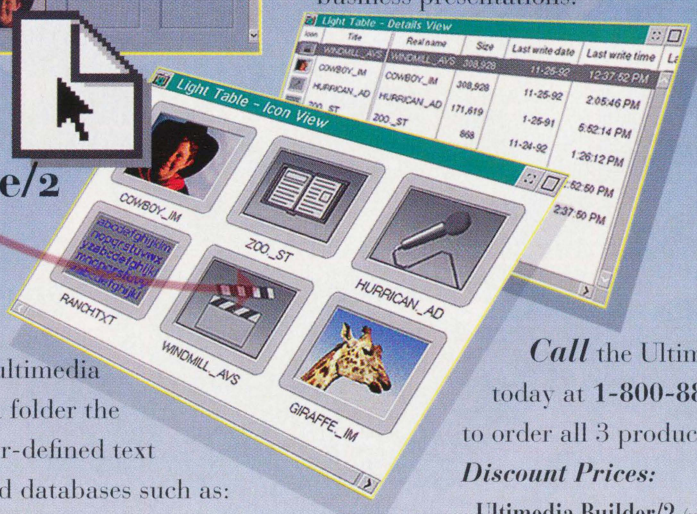
Ultimedia Builder/2

Cut, copy, paste, drag and drop images, text, audio, and video into Builder/2's film-strip-like work area to quickly ***create*** your multimedia business presentations.



Ultimedia Perfect Image/2

Retouch, resize, rotate, cut, copy, paste, drag and drop images to easily ***enhance*** pictures to add to your multimedia business presentations.



Ultimedia Workplace/2

Visually ***manage*** your images, text, audio and video multimedia objects with thumbnails arranged in a folder the way that makes sense to you. Add user-defined text definitions. And link it all to supported databases such as: dBase IV, Oracle, OS/2 Database Manager, and DB2/2. Multimedia tutorials, created with Ultimedia Builder/2, make learning to use the toolset a snap.

Call the Ultimedia Tools Series today at **1-800-887-7771**, Ext. 595, to order all 3 products at these ***Special Discount Prices:***

Ultimedia Builder/2	*(save over $100)*	***$239***
UltimediaWorkplace/2	*(save over $100)*	***$239***
Ultimedia Perfect Image/2	*(save over $50)*	***$120***

Stop by our booth at Fall Comdex in Las Vegas

IBM® OS/2 32-bit ULTIMEDIA TOOLS SERIES

Minimum requirements: IBM PS/2, 25-MHz 386 or greater processor; CD-ROM drive or 1.44 MB 3.5" disk drive, fixed disk, XGA or SVGA display adapter with appropriate color display. Keyboard and mouse; 12 MB internal memory for Builder/2, 8 MB internal memory for Perfect Image/2 and Workplace/2, and OS/2 2.1 with MMPM/2.

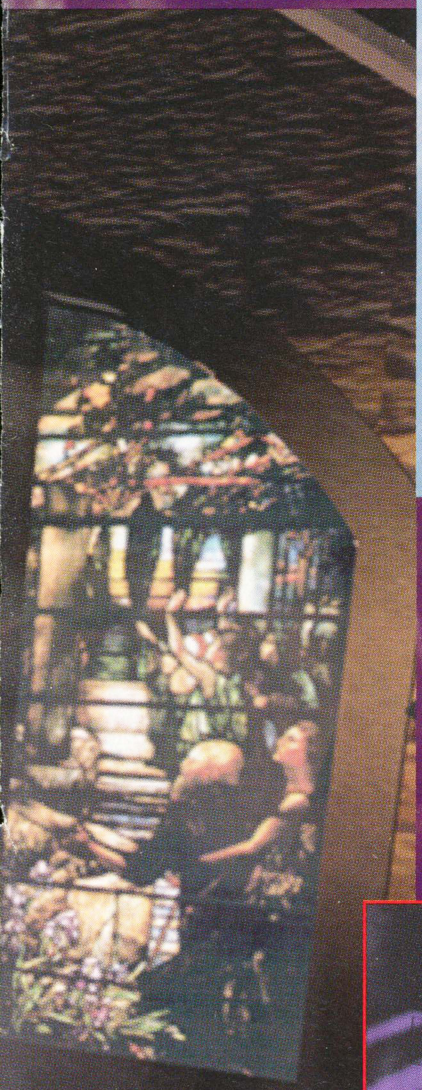
IBM, PS/2, OS/2, XGA, and MMPM/2 are registered trademarks of International Business Machines Corporation. Ultimedia, Ultimedia Tools Series, Perfect Image, Database Manager, DATABASE 2, and DB2/2 are trademarks of International Business Machines Corporation. dBase IV is a trademark of Borland International. Oracle is a trademark of Oracle Corporation.

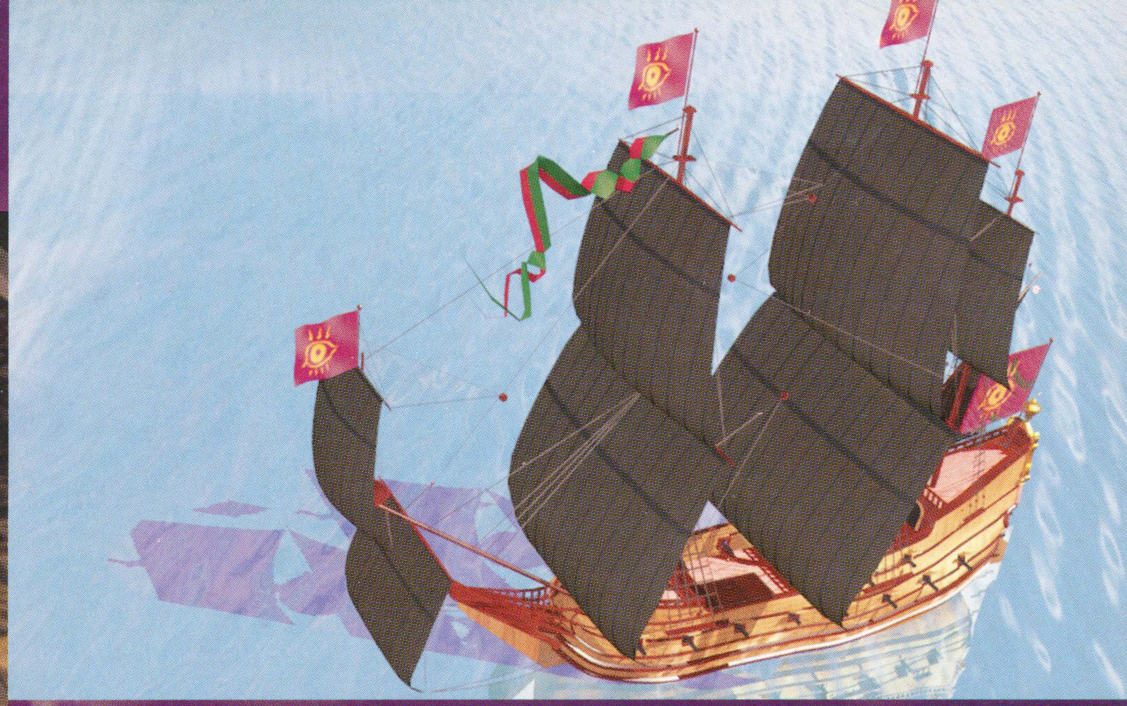
CIRCLE 37 ON INFORMATION CARD

Let your imagination run

©1993 Autodesk, Inc. All rights reserved. Autodesk, the Autodesk logo, and 3D Studio are registered trademarks of Autodesk, Inc.
Image credits: Dragon Sequence - Cyrus Lum, Chapel Interior - Gene Bodio, Ship ©1993, Kiib.

rampant.





New 3D Studio Release 3.

Let's cut to the chase. New 3D Studio® Release 3 software lets you create the same film-quality images as workstations. And it runs on ordinary PCs.

3D Studio comes with the most robust modeling and animation features. We've added analytical antialiasing, motion blur, gamma correction, even ray-traced shadows. So you can create photo realistic animations with workstation quality. Is it fast, you ask? Well, 3D Studio software has always staked its reputation on rendering speed. And now it's even faster than ever. But more important, now 3D Studio lets you do network rendering—so you can divide up and distribute

rendering tasks across an entire PC network. What used to take hours now takes minutes. But don't take our word for it. Just stop by your Authorized Autodesk Multimedia Dealer for a demonstration. You'll see the difference 3D Studio can make—even in the classroom. (We're offering special discounts for educational institutions around the country.) Or call 1-800-879-4233, ext. 274, for the Dealer nearest you. We'll send you a detailed brochure and a free 3D Studio Release 3 video. Outside the U.S. and Canada, fax 415-491-8311. **If you're already a 3D Studio user, call your Dealer to upgrade now.**

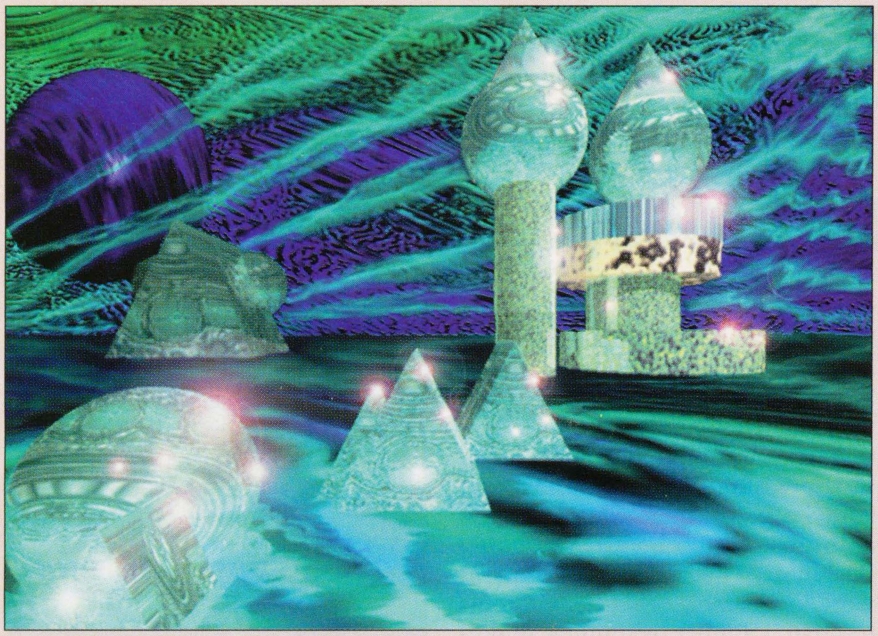
Autodesk.

CIRCLE 44 ON INFORMATION CARD

"Rundance"

"Thought and Memory"

The Mind's Eye



"Dawn Over Talandizue"

"Sunbather"

"Primates of Aldebaran"

My personal favorite is 'Thought and Memory,'" says illustrator Mike Mott, "because it deals with the duality of consciousness." The active figure in the image represents thought, he says, inasmuch as "our thoughts pretty much deal with events of the present and the future." The more contemplative figure depicts memory, which deals with the past.

To create most of the images on these pages, Mott relied heavily on the filter effects and paint tools provided by Adobe Photoshop (Mountain View, CA) and the rendering capabilities of Infini-D from Specular International (Amherst, MA) running on a Macintosh Quadra 700. In "Thought and Memory," for example, he manipulated a photograph of a model wearing a mask and created the wig of feathers in Photoshop. "I designed her clothing by taking little pieces of patterns from materials, mapping those [onto the model], and painting them," he says. To create the foreground elements and the castle, he used Infini-D. "Before I added the spheres, I mapped the image as it existed [onto the spheres] to achieve a reflective effect."

"Thought and Memory" also reflects Mott's interest in surrealist art, with the perspective of the piece skewed to be "the reverse of what exists in the real world." In the real world, he says, "the horizon is curved downward at the edges. But since this is an image that deals with an internal perspective, I used Photoshop to paint in the opposite curve."

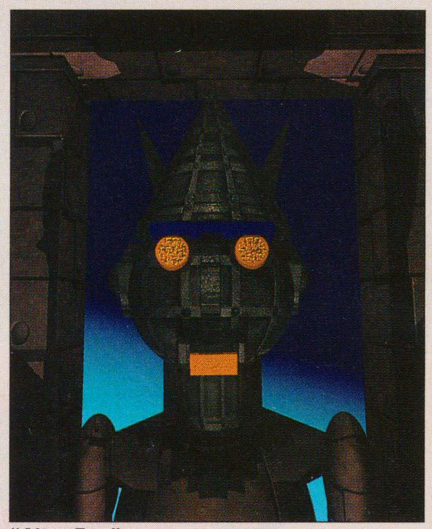
"Rundance," inspired by Mott's interest in primitive art, was created on an Intergraph system running the company's DP Studio and ModelView packages. Says Mott, "I wanted to achieve a cave-painting look in a high-tech fashion."

— Diana Phillips Mahoney

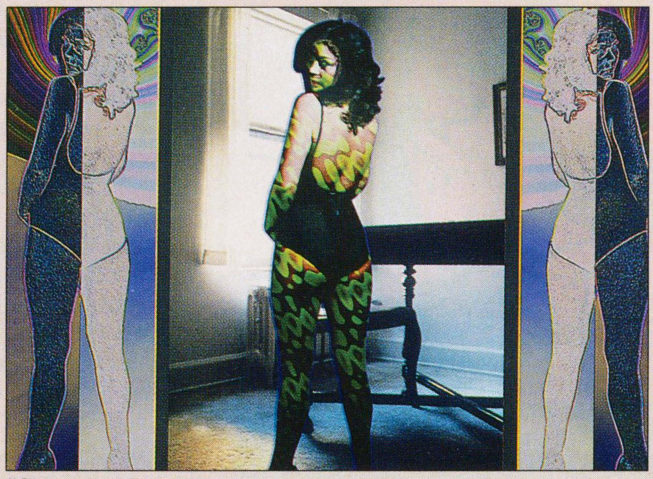
Beauty and Purpose

Because he considers himself "more intuitive than a nuts-and-bolts type of programmer," Chicago-based artist Scott Becker is constantly looking for "something that allows me to work a little faster without getting bogged down into detail." To meet this objective, he finds himself "hovering among different [Macintosh-based] programs," including Strata's StrataVision 3D (St. George, UT), Ray Dream Designer (Mountain View, CA), Pixar's RenderMan (Point Richmond, CA), and Adobe Photoshop (Mountain View, CA).

Becker divides his art into two categories: portraits and political/societal commentaries. The former, he says, "are usually just aesthetic," while the latter are directly symbolic. For example, "Isis" represents a portrait of a woman "who struck me as having very classic aspects to her nature." To visually communicate this, he manipulated a photograph of the woman in Photoshop and added a fractal background and the columns, which he created using Designer. "Then I did a lot of paint work to assemble the different items together." Similar techniques underlie Becker's non-portrait images, which, he says, "are more about intellectualizing than evoking emotion." For example, he notes, " 'Chameleon' is supposed to be a wry commentary about society's view on sexuality."—*DPM*



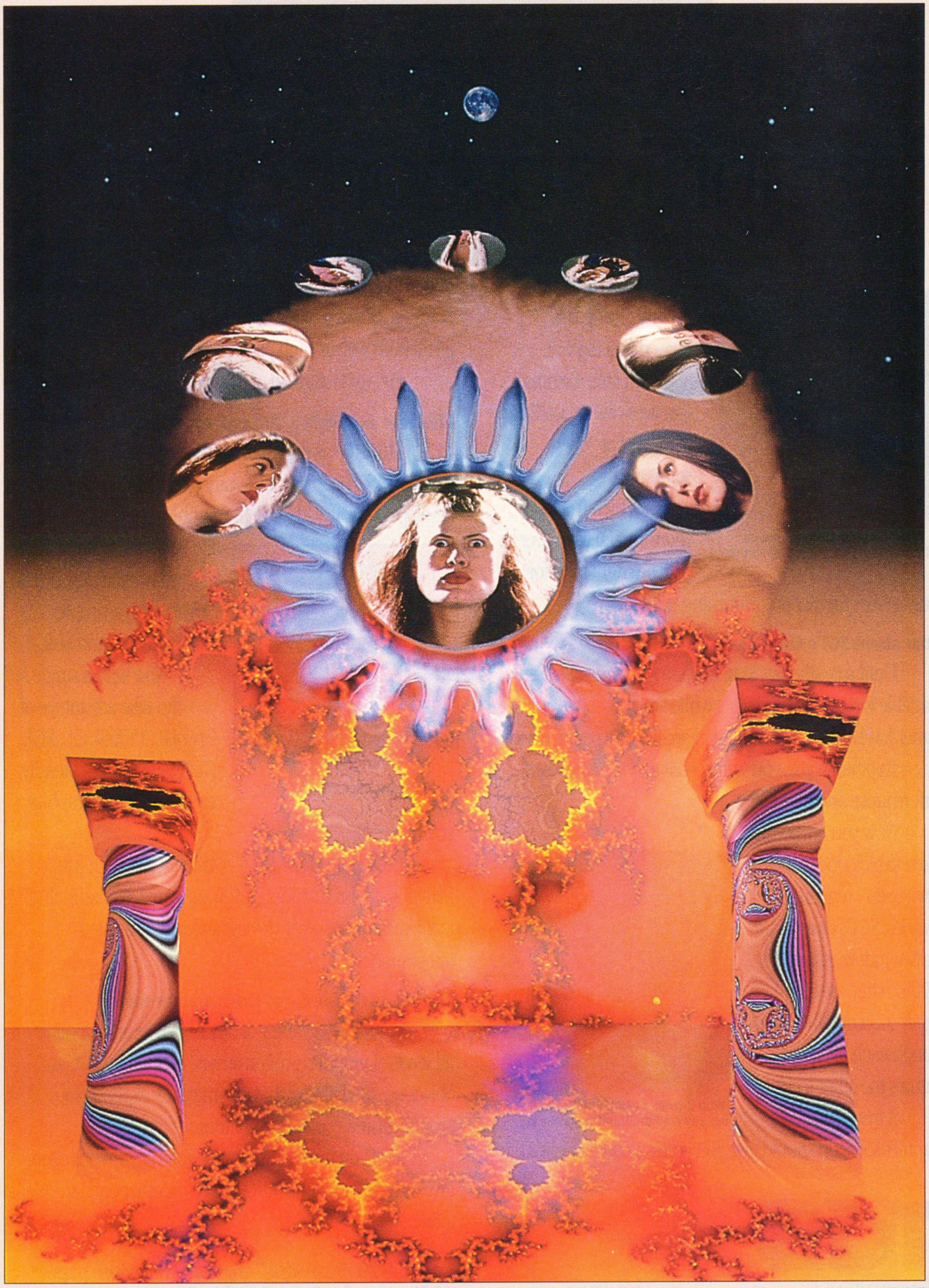
"Alter Ego"



"Chameleon"

"Yell"

"Universe Small"



"Isis"

FIGARO+ supports Windows NT in 1993!

Are you leaving your graphics options open?

FIGARO+ programs will run on platforms from PCs to supercomputer.

Open graphics programming has arrived in a big way.

In fact, it seems like everyone now offers some sort of "open" solution.

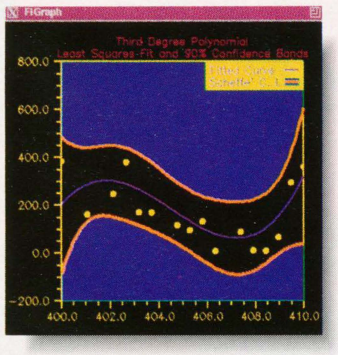
Which makes it more crucial than ever to pick the right tools for your future graphics programming needs.

What about SGI's OpenGL or MIT's PEXlib?

Until recently, low-level rendering libraries were only available for specific hardware, while the trade-off for most higher level API's was a decline in application performance.

In other words, you were forced to choose between performance and portability.

Now you are being asked to pick one of the new "open" rendering libraries: SGI's OpenGL or the X Window System's PEXlib. They are completely incompatible, even though each offers features the other lacks.



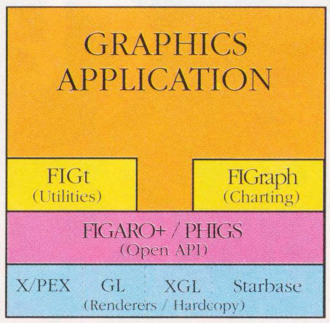
With 2 calls, FIGraph makes creating any kind of 2D or 3D chart easy.

A true open graphics solution should give you access to *both* OpenGL and PEXlib, local acceleration with SUN's XGL and HP's Starbase, access to your "old" graphics terminals and printers, as well as high performance.

FIGARO+ does all of this, and more.

FIGARO+ is PHIGS+, the real open graphics solution.

FIGARO+ is a high performance version of PHIGS+, the ANSI/ISO open graphics standard. FIGARO+ lets you develop sophisticated 2D & 3D graphics applications that can be ported from PC's to supercomputers, OpenGL to PEXlib, with a simple recompilation and link.



Open Graphics Environment.

Now with a single API you can take advantage of OpenGL, PEXlib, GL, XGL, GLX, Starbase — literally every important graphics environment.

Even better, FIGARO+ is much more than just PHIGS+. It also includes performance extensions including immediate mode, post-to-view and window system integration.

The FIGARO+ family of programmer tools.

We provide a variety of other open graphic toolkits for all levels of graphics programmers, including FIGt, an object-oriented library that dramatically expands your programming power and abilities.

So if you want to keep your graphics options open, give us a call about FIGARO+ and our other open solutions today.

Call 1-800-544-4847 for your free white paper *"A Strategy for Open Graphics".*

TGS

All trademarks belong to their respective companies. Copyright ©1993 by Template Graphics Software, Inc., 9920 Pacific Heights Blvd., Suite 200, San Diego, CA 92121. 619-457-5359, FAX: 619-452-2547, e-mail: info@tgs.com.

Of Space and Time

Macintosh visualizations of redesigned space station help Congress see what US space dollars can buy

By Diana Phillips Mahoney

When the White House requested that NASA redesign the Space Station Freedom last February because of cost considerations, the space agency went back to the drawing board to devise more affordable alternatives. To help both legislative supporters and detractors better understand what the redesigned space station could look like, NASA commissioned a Houston-based industrial design company to create 3D computer visualizations of various redesign options under consideration.

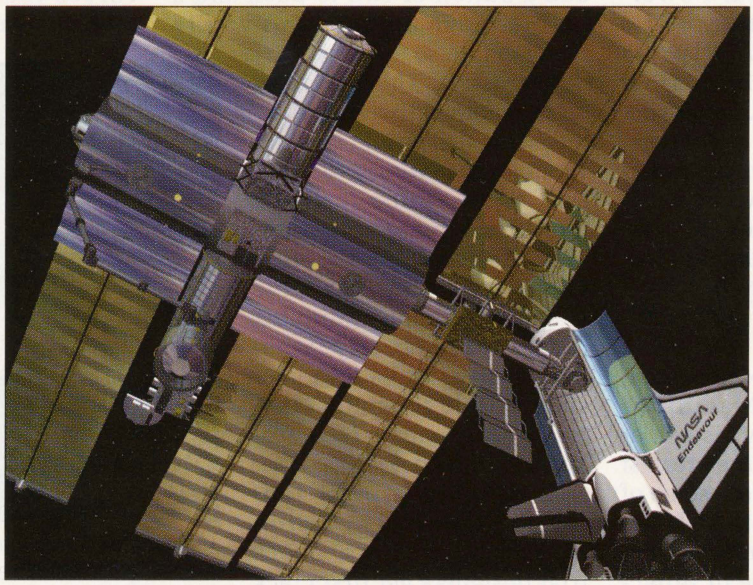
John Frassanito & Associates developed images to depict two of the proposed redesigns, referred to as Option A and Option C. The former, which NASA eventually decided to pursue, was basically a reconfiguration of the Space Station Freedom. Because JF&A had been involved with the Freedom project, the company had already modeled many of the pieces it would need for the Option A visualization. Option C was a departure from the Space Station Freedom layout, thus it required more modeling at the outset.

All of the models, new and existing, were created with Presenter Professional 3D modeling software from VIDI (La Puente, CA) on a Macintosh IIci. Although many of the major aerospace companies involved in the structural design of the space station use computer modeling, "their models aren't really meant for visualization; they are better suited for structural analysis or manufacturing documents," says JF&A industrial designer Lloyd Walker. Consequently, JF&A modeled all of the space station pieces from scratch. This approach, he says, was consistent with the role the visualizations were meant to play in the redesign effort. "Ours is more of an intuitive design kind of process for a rapid overview than a detailed engineering process. Typically we're working with concepts or generating ideas rather than modeling something that already exists."

Based on communication with the redesign team in Crystal City, Virginia, JF&A developed various space station configurations. When new elements were to be included—such as Russian Soyuz vehicles to be used as "lifeboats"—the company would take advantage of its proximity to the Johnson Space Center to obtain supporting information.

For many of the pieces, Walker notes, "We started with a sketch done by hand and we would scan that into the computer to use as a template in the 3D modeler." The designers would then modify the images, often based on interaction with NASA engineers. He adds: "Because the software is dimensionally accurate, I could go in as the model evolved and scale the different pieces."

Because the imagery was for presentation purposes only, "our models just needed to be reasonably accurate," says Walker. "The station is



Visualizations of the proposed space station redesigns turned Lloyd Walker's Macintosh into a rendering workhorse. The images—such as this one of Option C—required from 10 to 15 hours of rendering time each because of their high resolution as well as the level of shadowing and reflection.

Diana Phillips Mahoney is senior associate editor of *Computer Graphics World*.

several hundred feet long, so we were building only to within, say, one-tenth of an inch. The models were accurate enough that we could determine if there were any interferences, and certainly so that it was visually realistic."

Walker notes that while some of the individual components were difficult to model, such as the lattice-like trusses comprising many angles "that were difficult to get just right," the more significant challenge was managing the model database. "The project was extremely complex, just in terms of the number of pieces and all of the changes that were required. Fortunately, [Presenter Professional's] object group structure was perfect for dealing with this." In fact, even though JF&A has a Silicon Graphics workstation and NASA "has hundreds of SGIs," Walker chose the Macintosh-based modeling program because, he says, "It's the easiest modeler I've ever seen on any platform to keep track of this kind of complex model database."

Additionally, Walker feels his well-equipped Macintosh IIci (with 32MB of RAM, a DayStar PowerCache 50MHz accelerator, and a 32MB YARC Systems VIDIxpress board) provides "an incredible amount of empowerment. I'm the designer and illustrator and at the same time I keep track of my own Macintosh. I'm not slowed down by needing a systems administrator to keep my system and peripherals running, so I can move very quickly."

Considering the space station images were of such high resolution (2000-by-1600 pixels, six times that of a normal 13-inch Macintosh screen), "moving quickly" is a relative expression. "To get the greatest amount of visual resolution, some of the images took from 10 to 14 hours apiece to render, particularly because of the high degree of reflection and shadows," says Walker. Without the YARC Systems accelerator board, "Those images might have taken 100 to 150 hours. The [RISC-based] board accelerates the ray-tracing, which is the most time-intensive kind of rendering."

On more than one occasion, just as the renderings were nearly or completely finished, Walker received a phone call from the redesign team informing him of a change in the space station configuration, sending him back to his Mac. Such last-minute changes, he says, come with the territory. "When you're dealing with something that's as much a political issue as the space station and involves as many people, the model database has to evolve with the team's most current thinking." Fortunately, computer technology makes this feasible. "Using traditional airbrush, the [renderings] would easily have taken 200 hours to do by hand. For us, once the model is built, all of the information is already there. You just let the computer go to work."

Once the images were rendered, Walker used Adobe Photoshop for the finishing touches, such as compositing the models onto scanned backgrounds. The files were then sent to a service bureau for film recording, after which the images (in the form of color prints and overhead transparencies) were sent to Washington. "Because there was a lot of time pressure, there couldn't be any mistakes up front. The images were going to Congress, so it wasn't like I could call up and say, 'Oh well, I need one more day.' " *CGW*

Modeling a Mouse

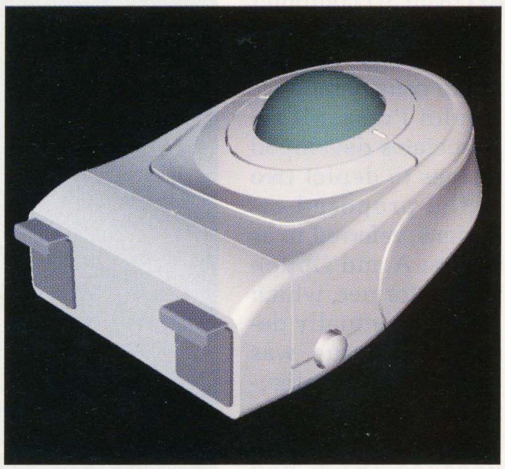
Earlier this year, Microsoft Corporation contracted the Stratos Product Development Group of Seattle to design the Ball Point Mouse 2.0, a portable computer trackball. Big deal, right? I mean, a mouse is a mouse is a mouse. Design a casing, throw in a circuit board, add a button or two to push and a ball to move around, and you're ready to roll, so to speak.

Not so fast. This was to be an ergonomically correct device. One that would be comfortable, that would mold to the hand. Such criteria would mean a product design defined by variable geometry, non-primitive shapes, and many complex radii. Consequently, what may appear to be an unassuming little computer interface was actually a technical amazon to model.

Making the project a bit more interesting, Microsoft requested that Stratos' industrial designers get first crack at the trackball, without the input of the company's product engineers. Typically the two groups work together to make sure early on that the design components stay within realistic parameters, but Microsoft didn't want such concerns to inhibit the designers' creativity.

As a result, the industrial designers presented the product engineers with a trackball design conceived without the technological boundaries imposed by conventional modeling technology.

To meet this design challenge, the engineers relied on the parametrics-based modeling offered by SDRC's (Milford, OH) I-DEAS 6.1 software running on a Hewlett-Packard 720 Unix workstation. (Parametrics involves the numerical control of geometry through the manipulation of tangental surface dimensions. In its documentation, SDRC refers to it as variational design.)

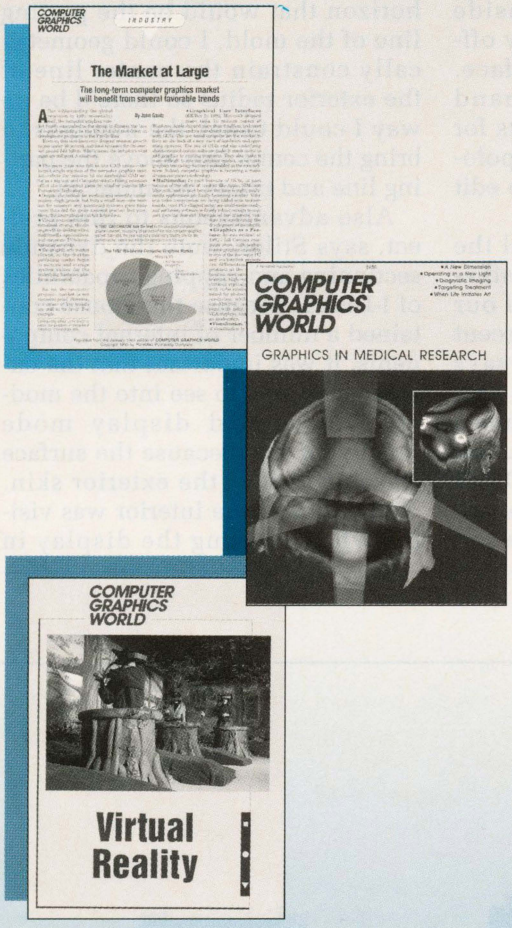


Using parametrics, engineers "handled" the task of modeling Microsoft's ergonomically correct Ball Point Mouse 2.0.

According to Will Stiles, product engineering manager at Stratos, "We had this constantly changing topology, so the geometry required a lot of lofting, which involves creating sections and stringing NURBS surfaces over the top to smooth it out, essen-

REPRINTS

PennWell Graphics Group Reprints for Sale



1. **CAD/CAM** **$12.00**
   Reaching out to solid modeling and industrial design, 32 pages
2. **Computer Graphics in Animation** **$7.00**
   The challenge of generating realistic characters, 16 pages
3. **The Dawning of 3D GIS & Desktop Mapping** **$7.00**
   As 3D GIS emerges, desktop mapping systems solve strategic business problems, 16 pages
4. **Landscape & Site Design** **$12.00**
   Walk with computer graphics through architectural landscape & design, 32 pages
5. **Graphics in Medical Research** **$9.50**
   From research to treatment, 24 pages
6. **Graphic Arts** **$7.00**
   Developers are overcoming the complexities of color publishing & reproduction, 16 pages
7. **The Typeface Analogue** **$10.00**
   This comprehensive typeface directory contains a list of over 3,500 typefaces that have alternate names, 26 pages or disk
8. **The Market at Large** **$3.50**
   The computer graphics market will grow to $65 billion by 1997, 4 pages
9. **Virtual Reality** **$12.00**
   Explore to what extent virtual reality is finding use in practical applications from engineering to science, 36 pages
10. **Desktop Publishing Fundamentals** **$12.00**
    Hands-on information covering today's hottest desktop publishing topics, 36 pages

tially the way an airplane wing or boat might be done." Defining the advanced lofted geometry using parametrics allowed the engineers to deal with the subtle dimensional shifts. "On its face the complexities might not be obvious," says Stiles, "but if you look at the mouse from the top, it's actually oval-shaped; if you look at it from the side, it kind of has a 15-degree tapered bend in it; and if you look at it from the front, there's also compound exterior radii on it."

Applying Skin Groups

By describing various dimensions, the engineers established paths for the application of skin groups to the sectioned geometry. For example, says Stiles, "I described the radius on the exterior and then the height and width of the section, and then put fillets at appropriate locations." As a result, he says, "You have this whole body that's made up of sections—in this case 35—and you have the ability then to kind of tweak these numbers as a whole group [to modify local or overall geometry]."

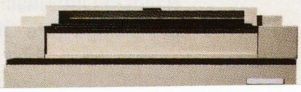
APPLICATIONS

Stiles was able to customize the system to the trackball application by writing a number of scripts made up of standard CAD commands that are available through the software. One example was the creation of scripts to control the shelling function. Shelling refers to the process by which the inside surface of a part is created by offsetting from the outside surface. Because the shelling command could give inconsistent results for some of the very advanced topology, the engineers ran scripts to edit the respective parametrics.

"This enabled us to control the consistency of the shelling mathematically to make sure all of our wall thicknesses were 100 percent common in cross section," says Stiles. "I had 100- or 200-line programs in which I could substitute a value and then offset geometry." He adds that writing scripts in I-DEAS is particularly easy. "You can just turn a recorder on and record a certain sequence of commands. Then you can loop those commands for each section and go in and individually tweak the numbers."

Built-in safeguards make it impossible to tweak the parameters beyond the boundaries of manufacturability. For example, says Stiles, "I could put in something that wouldn't allow, say, the center line of the radius to come above the parting line. So if I described a horizon that would be the parting line of the mold, I could geometrically constrain the center line of the exterior radius so there'd be no way I could tweak the numbers to bring the center line above the parting line and create an undercut."

Also advantageous to this project, says Stiles, were the dynamic sectioning and capping capabilities of I-DEAS. Because the mouse contained a number of internal components, it was important that the engineers be able to see into the model. The shaded display mode precluded this because the surface was covered by the exterior skin. And although the interior was visible when viewing the display in



wireframe mode, "that becomes just a jumbled mess of stuff if you have high-density packaging." The dynamic sectioning function, which provides three clipping planes for sectioning through the solid, lets the engineers achieve the perspectives they needed. This, along with the capping function (which caps the sectioned areas and allows the user to color the capping), increased production efficiency many times over. "[With them], we could peruse the whole assembly and do interference checking, because any of the parts that were interfering in space would show up in a different color than the capping color," notes Stiles.

The ability to check interferences came in particularly handy early in the project, when Stratos was integrating into its 3D database the 2D information provided by the designers of the trackball's printed circuit board. According to Stiles, "We'd put [the data] into our solids and instantly, using the dynamic sections, we were seeing interferences. These can be common in any product development cycle, but because we caught them early, we could address problems immediately."

Also important to the modeling process, says Stiles, was the designers' ability to fully exploit the capabilities of I-DEAS, thanks to the horsepower provided by the HP 720 workstation. "One of the advantages was full, real-time 3D rotation of the solids. Without powerful hardware, you'd see solids paging during rotation, making view manipulation difficult." Ironically, he adds, "The I-DEAS interface takes better advantage of the [Hewlett-Packard] platform than some of HP's own software products."

When the model was complete, it was sent directly to CAM. "Everything from stereolithography to the CNC parts was done without ever setting foot in any of the shops," says Stiles. Most of the information exchange was completed via high-speed modem, with the exception of data transfer between the manufacturer, an off-shore Japanese company. "We had a little problem getting them to conform to modem connections, so we used overnight air to get them tapes in a day," he says, adding: "It was crucial that the manufacturer be able to handle 3D databases, because the shapes were compound enough and lofted enough that it would be very difficult to try to describe that two dimensionally." —*DPM*

We could peruse the whole assembly and do interference checking, because any of the parts that were interfering in space would show up in a different color."

Look again.

Trade in your old plotter and receive $1,000 off the purchase of an HP DesignJet 650C color inkjet plotter.*

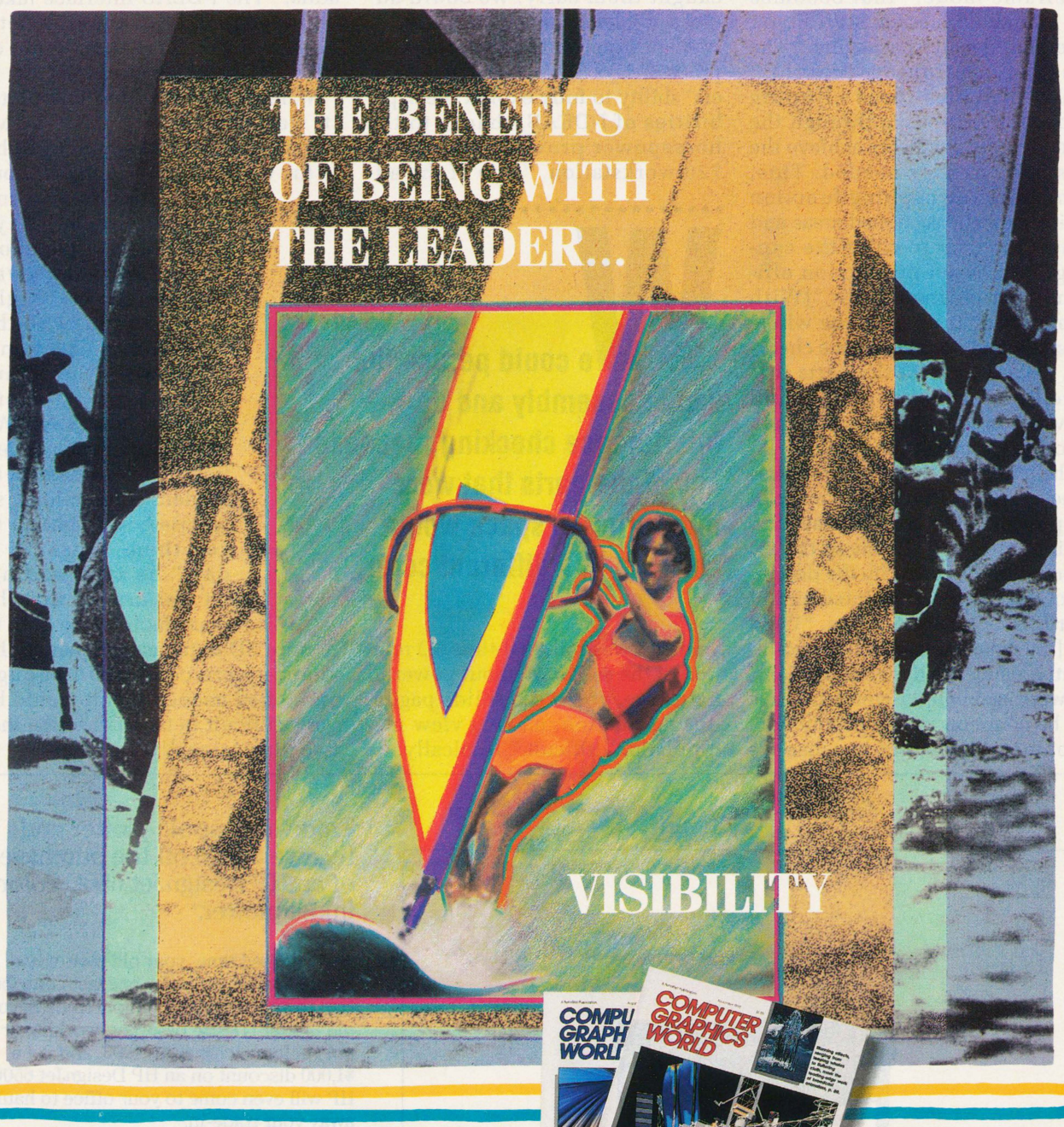
For a limited time, your old plotter has an opportunity to make one last contribution to your business. Simply trade in your old plotter (D-size or larger, working or not) before October 31, 1993, and get a $1,000 discount on an HP DesignJet 650C.** HP will even come to your office to haul away your trade-in.

You can find out more about our offer at your HP plotter demo dealer. Just call 1-800-851-1170, Ext. 7354 for the location nearest you.† And prepare to give your old plotter its last hurrah.

HEWLETT PACKARD

©1993 Hewlett-Packard Company *Offer may vary in Canada. **Some restrictions apply. †In Canada, call 1-800-387-3867, Ext. 7354. PE12306

THE BENEFITS OF BEING WITH THE LEADER...



Leading a field of tough competitors, a champion boardsailor tacks in a stiff offshore breeze.

Leaders in any competition create increased awareness for themselves and for those associated with them.

As the leading magazine in the computer graphics industry, *CGW* reaches more than 205,000 loyal, avid readers *worldwide* across a broad spectrum of applications, from Design Engineering to Graphic Arts, Visual Communications, Science & Medicine, Architectural Design, and Mapping.

Each CGW reader spends more than $300,000 on products and services they know about.

By getting consistent, impactive advertising exposure in *CGW*, you have accomplished one very important thing...

More than 205,000 loyal, avid readers of *CGW* — *worldwide* — across the broad spectrum of computer graphics are now aware of *your product*, too.

For information on how to continue your successful advertising program with CGW, contact your regional advertising manager or call Bob Holton, publisher, at 508-392-2156.

COMPUTER GRAPHICS WORLD

A PennWell Publication

One Technology Park Drive, P.O. Box 987, Westford, MA 01886 TEL: 508-392-2158 FAX: 508-692-0525

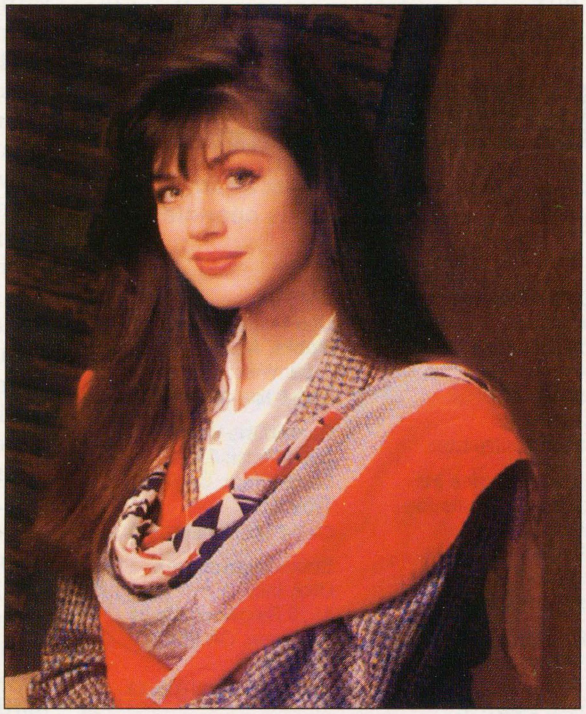
Colorful Choices

A broad price/performance range defines the market for color thermal transfer printers

By Bill Flynn

Application, application, application. If you're shopping for a color thermal transfer printer, keep this play on the old real estate maxim in mind.

Each of the two major types of thermal transfer technologies is appropriate to specific application suites, so your purchase decision will depend on how you intend to use the printer. Thermal wax transfer printers, for example, provide good color saturation, making them the best choice for presentation materials and certain kinds of proofs. On the other hand, thermal printers based on dye transfer technology offer the benefit of continuous-tone color, which provides the photorealistic output important to graphic arts applications. A comparison of the technologies used to drive both wax- and dye-based color thermal transfer printers will help clarify their performance distinctions.



The continuous-tone capability of dye transfer printing provides smooth, natural-looking color, as opposed to the detectable patterns of dithering characterizing wax transfer printing. This image was printed on the small-format Kodak 450GL Digital Color Printer.

In both wax- and dye-based printers, heat causes the transfer of color from a ribbon to the output media via a print head composed of discrete thermal elements. Each element—hundreds or more elements reside on a single head—is used to heat a spot on a transfer ribbon. The more spots a head can control, the higher the resolution (most of the thermal transfer printers available today, both wax and dye, provide 300dpi resolution). The transfer ribbon, sometimes called the donor, is composed of up to four colors in a repeating series: cyan, magenta, yellow, and sometimes black. (Summagraphics is planning a December release of a high-end thermal wax printer that uses separate, single-color donor ribbons, offering the possiblity of printing non-process colors such as metallic gold and fluorescents.)

With thermal wax transfer, the colors are carried in a type of wax adhered to a thin film and rolled up like a roll of paper towels. To accomplish printing, the three or four panels of color (which are at least as large as the media onto which they are printed) are brought up one at a time. The print head passes over each color panel in sequence. Because of this, the per-copy price is fixed (it costs the same in consumables to print each page regardless of what's on the page). The elements in the head alternately turn on and off, transferring very small dots of color directly onto the print media. Thus, the print head, via a thermal discharge, will transfer dots of cyan to every spot that cyan is needed on the page. In turn, it will do the same for magenta, then yellow, then black. (Cyan, magenta, and yellow alone are capable of producing a very good process black. But for those times when only "true" black makes sense, a four-color ribbon with a black panel is appropriate.) The end result is a page with very deep, well-saturated colors.

Wax printers can print anything, but they excel at presentation mate-

Bill Flynn is a market analyst for color hard copy at the market research firm of BIS Strategic Decisions in Norwell, Massachusetts.

rials. Overhead transparencies produced on a good wax printer are tough to beat and stand up to a fair amount of normal wear and tear, especially perspiration from nervous palms. Most offer some level of Pantone certification and so are also often useful for proofing. The latest generation of thermal wax printers range in price from just less than $3000 up to $30,000, depending on a multitude of features, such as speed, memory, and media handling.

Dye transfer printers, although they rely on a similar ribbon/print head configuration, take a very different approach. Whereas wax printers mostly have a set dot size, dye printers (in which the output media and the donor are specially formulated to work in tandem) place color using a diffusion process, allowing them to control the amount of color they pass to the media and to mix colors together in the same area. The result is smooth, natural-looking color rather than detectable patterns of dithering. It is this continuous-tone capability that allows dye transfer output to approach photorealism. In fact, dye transfer prints have the look and feel of photographs, and transparencies have the quality of slides when projected. However, the diffusion process of producing color makes fine lines and curves more difficult to achieve than with wax transfer. Dye transfer printers generally range in cost from $8000 to $25,000 for page size and larger. (There are also many small-format devices available for producing postcard-size output.)

Within both categories of printers, a number of factors influence cost and performance, among them the power of the printer controller. While much is being made of the clock speed of the latest generation of controllers on thermal printers, the differences have much to do with the way a controller is implemented, not simply its internal clock speed. Both Intel and AMD RISC-based processors have become common in color thermal transfer printers, generally running at 16MHz to 33MHz. As a very general rule of thumb, a faster clock speed can mean better performance.

Even with a high-speed processor, the performance of a printer will still depend to an extent on available memory. This is especially the case when printing large, complex files such as full-color photographic images, which will generally be run on dye transfer printers. While a fast, powerful host is certainly key, having a printer with its own power and intelligence also helps to speed things along. In general, the more memory your printer has, the more likely it is to be able to accept your jobs and turn the computer back over to you. Extra memory also means that the printer can accept downloaded soft fonts and keep them on hand, which is another time-saver. Some devices offer the ability to accept a hard drive, which can store many often-used fonts for faster retrieval. (There are techniques to handle larger files in chunks that allow for the best use of limited memory, but in general, more is definitely better.)

Another issue is PostScript support. Some controllers feature built-in PostScript support in the form of an integral hardware RIP (Raster Image Processor), which converts the data from the host computer to printable form. Hardware RIPs cost more than software RIPs, however hardware RIPs are faster. PostScript Level 2-compatible hardware RIPs add extra zest to printing PostScript files and smoother color, particularly to wax printers. Deciding which level of PostScript support you need, or whether you need it at all, depends on the files you'll typically be printing. If you work with PostScript, you will need to have either a software or hardware PostScript RIP. The former, which resides on the host computer, uses up computer time to handle the file, while the latter frees up the computer because it resides in the printer. (In a few in-

PRODUCT GUIDE

Vendors of Color Thermal Transfer Printers

The following list includes vendors of both color thermal wax and dye transfer printers. Many of them offer a number of models spanning the price/performance spectrum.

CalComp
2411 W. LaPalma Ave.
Anaheim, CA 92801
Type: Wax
CIRCLE 131 ON INFO CARD

Fargo Electronics Inc.
7690 Golden Triangle Dr.
Eden Prairie, MN 55344
Type: Combination
CIRCLE 132 ON INFO CARD

Focus Graphics
3000 W. Olympic Blvd.
Santa Monica, CA 90404
Type: Dye
CIRCLE 133 ON INFO CARD

GCC Technologies
580 Winter St.
Waltham, MA 02154
Type: Dye
CIRCLE 134 ON INFO CARD

General Parametrics
1250 Ninth St.
Berkeley, CA 94710
Type: Wax
CIRCLE 135 ON INFO CARD

JVC
19900 Beach Blvd.,
Suite I
Huntington Beach, CA
92648
Type: Dye
CIRCLE 136 ON INFO CARD

Mitsubishi Electronics America Inc.
Information Systems Div.
991 Knox St.
Torrance, CA 90502
Type: Both
CIRCLE 137 ON INFO CARD

NEC Technologies Inc.
1414 Massachusetts Ave.
Boxborough, MA
01719-2298
Type: Wax
CIRCLE 138 ON INFO CARD

Oce Graphics
385 Ravendale Drive
POB 7169
Mountain View, CA
94039-7169
Type: Wax
CIRCLE 139 ON INFO CARD

Panasonic
Office Automation Group
Two Panasonic Way
Secaucus, NJ 07094
Type: Wax
CIRCLE 140 ON INFO CARD

QMS Inc.
One Magnum Pass
Mobile, AL 36618
Type: Wax
CIRCLE 1401 ON INFO CARD

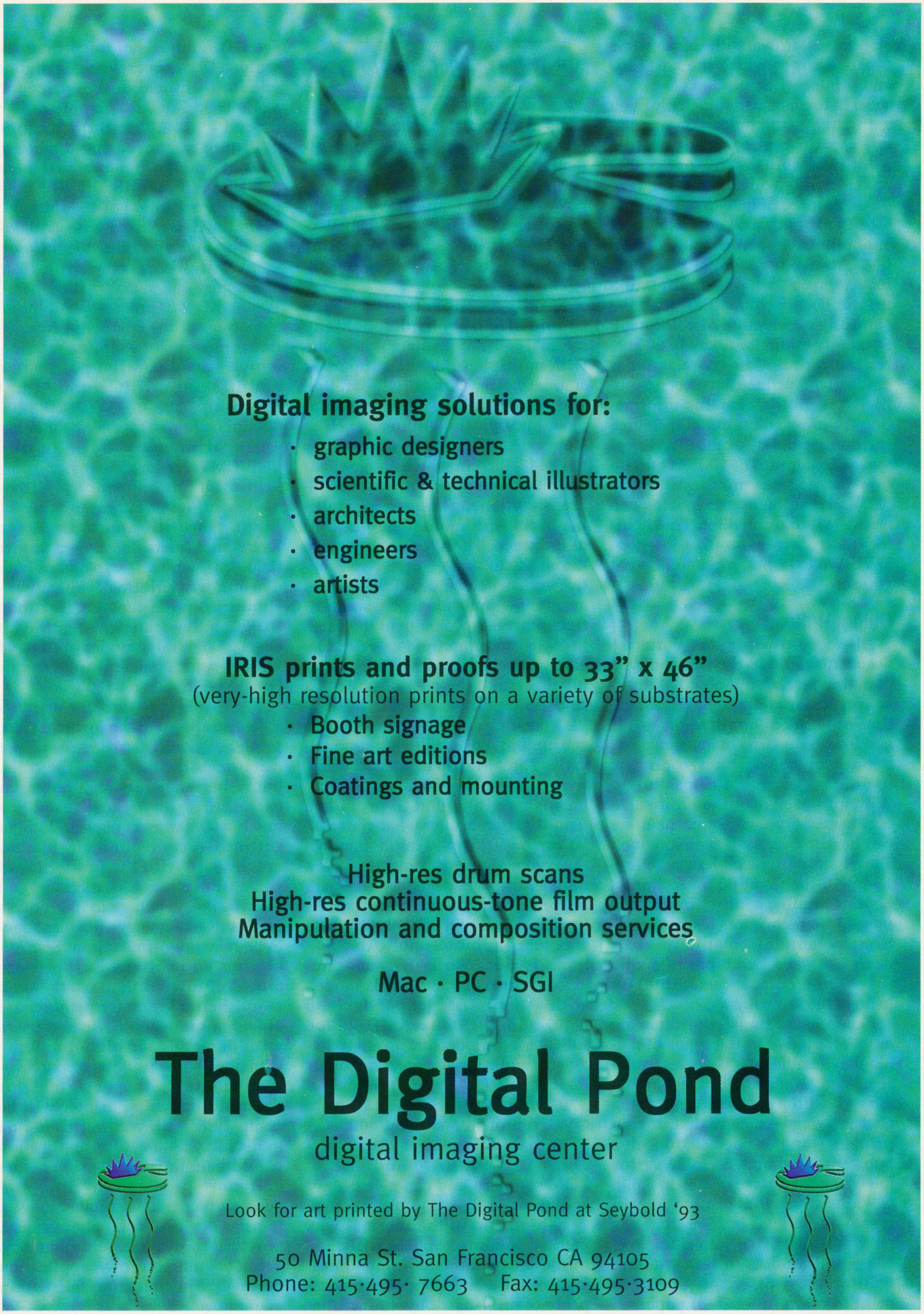
RasterOps Corp.
2500 Walsh Ave.
Santa Clara, CA 95051
Type: Dye
CIRCLE 142 ON INFO CARD

Seiko Instruments USA Inc.
1130 Ringwood Court
San Jose, CA 95131
Type: Both
CIRCLE 143 ON INFO CARD

Summagraphics Corp.
8500 Cameron Road
Austin, TX 78754
Type: Wax
CIRCLE 144 ON INFO CARD

SuperMac
485 Potrero Ave.
Sunnyvale, CA 94086
Type: Dye
CIRCLE 145 ON INFO CARD

3M
POB 33050
St. Paul, MN 55133-9901
Type: Dye
CIRCLE 146 ON INFO CARD



CIRCLE 29 ON INFORMATION CARD

stances, a hardware RIP resides in a separate box to which the host CPU and printer are connected.)

To help ensure that the color you get matches the color you expected, a color management system (CMS) is a valuable feature. These are becoming widely available (Kodak, Pantone, EFI, Agfa, and Apple all offer them), and some printers are optimized to work with a given CMS. RasterOps' Correct Print 300, for example, is a dye-sublimation printer that is compatible with the company's own suite of color management products. A key issue here is whether or not the characteristics of the given printer have been "profiled." A profile contains information on how a certain color device (printer, scanner, or monitor) produces its output. The CMS is told up front that a user is printing to printer "X" and that the user is looking at a brand "Y" color monitor. This helps to ensure a reasonable level of WYSIWYG (what you see is what you get).

Output Options

Also factoring into the purchase decision should be the size and type of output media an individual printer accepts—an important consideration in terms of application needs and long-term costs of consumables. Because of the way transfer printers handle paper, it isn't possible to print an image over the entire area of a page. However, some printers can handle oversized media, which allows for a full-bleed image. (Using 12-by-18-inch media, for example, permits printing a full 11-by-17-inch image.) Some printers also offer optional secondary media trays so users can have two types of media (paper and film, for example) on hand at the same time.

Because dye transfer printers are more restrictive in the types of media they handle—they use a specially coated paper or film formulated to work with a specific printer—the cost per page exceeds that of wax printers (the per-page cost for dye transfer ranges from $3 to $7 versus the wax transfer cost of $.50 to $.65). Obviously, whether or not this will create a financial burden depends on the prospective print volume.

Several models of wax transfer printers now offer the ability to print to plain (uncoated) paper. In

some instances, this requires the use of a special ribbon for maximum effectiveness. Because the fixed cost per page is high for text-only output, however, the benefits of using plain versus special paper can be elusive. Basically, if you're mostly printing plain-paper text, use a laser or inkjet printer.

Finally, connectivity issues should also be considered. Many thermal transfer printers now come with multiple interface support as standard fare, with serial, parallel, and LocalTalk being the most common. Multiplexing printers, such as Panasonic's EPL-8541 wax transfer model ($8995) in which a four-channel multiplexer is optional, even allow simultaneous access by multiple users with more than one kind of interface. These printers feature the ability to sense which port is active and switch automatically. Some even allow multiple jobs from multiple sources to come in at the same time. Because multiple users can be easily attached, multiplexing capabilities make the cost of a professional color printer easier to justify.

Depending on an individual printer's options, costs will vary dramatically. The following specifications, while not all-inclusive by any means, are intended to provide a frame of reference for what your dollar can buy. (Keep in mind, many of the companies in this market offer a number of printer models that span the price/performance spectrum.) At the lower end of the 300dpi thermal wax market, for example, the Tektronix Phaser 200e has a manufacturer's list price of $3695. This model, with 4MB of RAM (expandable to 8MB) and a 16MHz AMD 29000 RISC-based processor, prints to letter-size and A4-size paper and offers PostScript Level 2 support. For $7995, the ColorScript 230 from QMS, running on an Intel 80960CA RISC-based controller at 25MHz, provides 13MB of RAM and 4MB of ROM standard and can give output as large as 11-by-17/A3 bleed. At the very high end of the thermal wax market, Summagraphics will soon introduce its SummaChrome Imaging System, a large-format printer capable of printing 24-by-40-inch images. Two models of the printer are set for a December release, including one for technical design priced at $24,995 and one for graphic design priced at $29,995. Both include 170MB of memory (upgradable to 500MB), and the graphics model has a 33MHz MIPS PostScript RIP. Both provide a resolution of 406dpi.

On the dye-transfer side, $10,000 can buy Seiko's Professional ColorPoint PSH, which comes with 16MB of memory and a 25MHz RISC-based Weitek XL8220 processor. Additional features of the PostScript-compatible printer include off-line printing, a high-speed parallel port, and a multitasking architecture. At just less than $20,000, JVC's SP2200 300dpi color dye transfer printer has 48MB of memory built in and RGB/CMYK color-conversion capabilities. It has a PostScript RIP as well as an Adobe Photoshop driver.

For a no-frills approach, Fargo Electronics offers its Primera printer (203 dpi), which is capable of both dye and wax printing. The very basic wax version lists for less than $1000; a dye transfer upgrade kit costs $249; and a model optimized for full-color image printing can be bought for less than $1500.

A new class of transfer printers may also appeal to the low-end color printer market. These devices do not use wax as the carrier for the color, but rather, they rely on a polyester carrier that can be heat-fused to a much wider array of papers. Without getting overly technical, this has much to do with the properties of paper (smoothness, for example) and the way colors adhere to it. Products using this technology—such as soon-to-be-released printers from Star Micronics and Citizen Europe—are aimed at low-volume users. Most color thermal transfer printers are aimed at more sophisticated users with demands for higher volume who often share printing resources.

Ultimately, the best test for determining which printer will be compatible with your needs is first to decide whether your application would benefit from the rich colors and more precise fine lines and curves that can be achieved by wax transfer devices or the photorealism provided by dye transfer technology. Then, try out your own application on several printers that fall within your budget. *CGW*

Chyron Centaur Domestic Dealer List

Arizona
Compu Animate dba Silicon Solutions
Tel: 602-254-4668
California
R.E. Snader
Tel: 415-332-7070
RFX, Incorporated
Tel: 213-851-2100
Micro Age
Tel: 619-566-1900
Vas Tech, Inc.
Tel: 415-922-8324
Colorado
G.W. Hannaway
Tel: 303-440-9631
Robert Waxman
Inc.
Tel: 303-623-1200
Florida
Image Resources,
Inc.
Tel: 407-843-4200
Georgia
Image Resources,
Inc.
Tel: 404-512-7100
Hawaii
Honcad
Tel: 808-537-9607
Illinois
Corplex
Tel: 708-673-5400
Maryland
Executive Presentations
Tel: 301-230-2024
Sylvest Management Systems
Tel: 301-459-2700
Massachusetts
Crimson Tech
Tel: 800-321-5150
Cambridge Electronics
Tel: 617-492-4999
Michigan
Paradise Digital Sales
Tel: 313-471-2090
New Jersey
Impressions with Software, Inc.
Tel: 908-232-3553
New York
Video Corporation of America
Tel: 212-967-4400
B.C. Communications, Inc.
Tel: 516-549-8833
Ohio
Kaleidoscope Animations, Inc.
Tel: 216-360-0630
Oregon
CSI Video Systems
Tel: 503-224-6626
Pennsylvania
Parsec Systems
Tel: 717-948-9010
Tennessee
Marshall Graphics Systems
Tel: 615-399-8896
Texas
DataCore, Inc.
Tel: 210-690-0641
Digital Sight & Sound, Inc.
Tel: 214-702-1788
Utah
Osborn Video Presentations
Tel: 801-226-1989
Virginia
Source Digital Systems
Tel: 703-821-6800
Washington
CSI VideoSystems
Tel: 206-624-2833
Personal Workstations, Inc.
Tel: 206-828-4223
Canada
Vidcom Communications Ltd.
Tel: 604-732-9711
Video Design Systems, Inc.
Tel: 416-453-3211

Please direct
international inquiries to:
+ 1 (516) 845-2031
or Fax + 1 (516) 845-3895

From Chyron Graphics:

The Quality Video Solution!

Now available for SGI INDY™

The Chyron Centaur™ provides the quality video solution for the family of SGI Indigo™ workstations from Entry™, XS™, XZ24™, XS24Z™, and Elan™, supporting both R3000 and R4000 CPUs.

Centaur features multiple professional video formats, video capture, dual frame buffers and built-in V-LAN™ machine control. Available in PAL and NTSC.

Most major software developers from video and other disciplines support the Centaur. The Centaur also includes soft control panels for all functions so easy integration is assured.

THE PESA CHYRON GROUP

For additional information
return the Reply Card or call
Chyron Customer Relations
(516) 845-2031 or Fax (516) 845-3895

CHYRON Graphics

PESA CHYRON CMX AURORA

IRIS Indigo™ is a Trademark of Silicon Graphics Inc.

Copyright 1993 CHYRON Corporation

CIRCLE 38 ON INFORMATION CARD

EVENTS

October

12-14 Macromedia User Conference held in San Francisco. Sponsored by Macromedia. Contact: Macromedia, 600 Townsend St., San Francisco, CA 94103; 800/713-2001.

17-20 Sixth International Conference on Rapid Prototyping: Putting the Pieces Together held in Minneapolis. Sponsored by Management Roundtable. Contact: Charles Atkinson, Management Roundtable, 1050 Commonwealth Ave., Suite 301, Boston, MA 02215; 617/232-8080.

18-21 1993 Virtual Reality Systems and Teleoperation Conference held in New York. Sponsored by SIG-Advanced Applications Inc. Contact: Stan Goldstein, SIG-Advanced Applications Inc., 1562 First Ave., Suite 286, New York, NY 10028; 212/717-1318.

18-22 Systems '93 held in Munich, Germany. Sponsored by Kallman Associates Inc. Contact: Kallman Associates Inc., 20 Harrison Ave., Waldwick, NJ 07463-1709; 201/652-7070.

19-21 Media Summit held in New York. Sponsored by Reed Exhibition Companies. Contact: Debra Lee, Reed Exhibition Companies, 999 Summer St., POB 3833, Stamford, CT 06905-0833; 203/352-8254.

19-21 PC Expo held in Chicago. Sponsored by Bruno Blenheim Inc. Contact: Bruno Blenheim Inc., Fort Lee Executive Park, One Executive Drive, Fort Lee, NJ 07024; 201/346-1400.

20-23 Seybold San Francisco held in San Francisco. Sponsored by Seybold Seminars. Contact: Robbie Lapides or Beth Sadler, Seminars Division, 29160 Heathercliff Road, Suite 200, Malibu, CA 90265-6104; 310/457-8500.

25-29 IEEE Visualization '93 Conference held in San Jose, CA. Sponsored by IEEE Computer Society. Contact: IEEE Computer Society, 1730 Massachusetts Ave. N.W., Washington, DC 20036-1992; 510/423-9368.

26-28 The Common Desktop Environment Developers Conference held in San Jose, CA. Sponsored by UniForum. Contact: IDG World Expo, 111 Speen St., Framingham, MA 01701; 800/225-5620.

27-29 CD-ROM Expo and Conference held in Boston. Sponsored by Mitch Hall Associates. Contact: Mitch Hall Associates, 260 Milton St., Dedham, MA 02026; 617/361-2001.

29-31 VISCOMM held in New York. Sponsored by CMC. Contact: Andrea Cassello, CMC, 200 Connecticut Ave., Norwalk, CT 06856-4990; 203/852-0500.

30-Nov. 2 The Society of Motion Picture and Television Engineers Conference and Equipment Exhibit held in Los Angeles. Sponsored by SMPTE. Contact: SMPTE, 595 West Hartsdale Ave., White Plains, NY 10607-1824; 914/761-1100.

31-Nov. 3 Graph Expo held in Chicago. Sponsored by Graphic Arts Show Company Inc. Contact: Michael Gallagher, Graphic Arts Show Company Inc., 1899 Preston White Drive, Reston, VA 22091-4367; 703/264-7200.

November

2-3 Federal Imaging '93 held in Washington, DC. Sponsored by National Trade Productions Inc. Contact: Tom Lauterback, National Trade Productions Inc., 313 S. Patrick St., Alexandria, VA 22314-3567; 703/683-8500.

3-5 IS&T's Third Technical Symposium on Prepress, Proofing, & Printing held in Chicago. Sponsored by The Society for Imaging Science and Technology. Contact: IS&T Membership Office, 7003 Kilworth Lane, Springfield, VA 22151; 703/642-9090.

3-7 Fourth International Symposium on Electronic Art held in Minneapolis. Sponsored by Minneapolis College of Art and Design. Contact: FISEA '93, 2501 Stevens Ave. S., Minneapolis, MN 55404; 612/874-3754.

7-11 ICAD '93: International Conference on Computer-Aided Design held in Santa Clara, CA. Sponsored by The Association for Computing Machinery. Contact: Julie Eitzer, ACM, 1515 Broadway, New York, NY 10036-9998; 212/869-7440.

9-11 Autofact '93 held in Chicago. Sponsored by Society of Manufacturing Engineers. Contact: Beth Magewick, Society of Manufacturing Engineers, One SME Drive, POB 930, Dearborn, MI 48121-0930; 313/271-1500.

14-19 Electronic Document Systems Conference & Exhibit held in Denver. Sponsored by Xplor International. Contact: Jim Porter or Anne Davison, Xplor International, 24238 Hawthorne Blvd., Torrance, CA 90505-6505; 310/373-3633.

15-19 Comdex/Fall '93 held in Las Vegas. Sponsored by The Interface Group. Contact: The Interface Group, 300 First Ave., Needham, MA 02194-2722; 617/449-6600.

28-Dec. 3 Scientific Assembly and Annual Meeting of the Radiological Society of North America (RSNA) held in Chicago. Sponsored by RSNA. Contact: RSNA, 2021 Spring Road, Suite 600, Oak Brook, IL 60521; 708/571-2670.

29-Dec. 2 Virtual Reality Expo '93 held in New York. Sponsored by Meckler. Contact: Meckler, 11 Ferry Lane West, Westport, CT 06880; 800/632-5537.

December

6-9 SGML '93 held in Boston. Sponsored by Graphic Communications Association. Contact: GCA, 100 Daingerfield Road, Alexandria, VA 22314-2888; 703/519-8160.

January

6-8 ShowBiz Expo East and East Coast Theatre Conference held in New York City. Sponsored by ShowBiz Expo. Contact: ShowBiz Expo, 2122 Hillhurst Ave., Los Angeles, CA 90027; 213/668-1811.

15-18 Milia held in Cannes, France. Sponsored by Midem Organization. Contact: International Exhibition Organization Inc., 475 Park Ave. S., Ninth Floor, New York, NY 10016; 212/689-4220.

24-26 The Photoshop Conference held in San Francisco. Sponsored by Thunder Lizard Productions. Contact: Marci Eversole, Thunder Lizard Productions, 4021 Aurora Ave. N., Seattle, WA 98103; 206/633-3431.

February

4-6 Graphics Plus '94 held in Secaucus, NJ. Sponsored by Print/New Jersey. Contact: Print/New Jersey, POB 6, Kearny, NJ 07032; 201/99-PRINT.

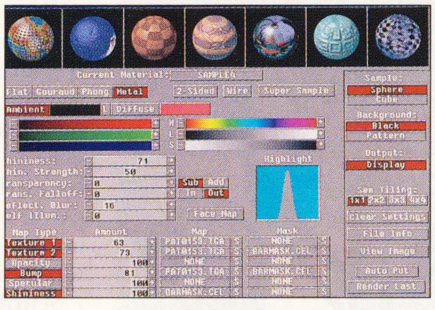
6-10 IS&T/SPIE Symposium on Electronic Imaging Science & Technology held in San Jose, CA. Sponsored by IS&T, The Society for Imaging Science and Technology and SPIE, The International Society for Optical Engineering. Contact: The Society for Imaging Science and Technology, 7003 Kilworth Lane, Springfield, VA 22151; 206/676-3290.

Beefing Up 3D Studio

Autodesk's new release is packed with such features as image-projecting spotlights and gamma correction

Autodesk Inc.'s Multimedia Division continues on its course of providing users with frequent and major upgrades to its 3D Studio with Release 3 (shipping this month). The enhancements to this PC-based modeling, rendering, and animation program number more than 200. Furthermore, the gang from Sausalito, California, has added a new CD-ROM containing more than 500MB of 3D mesh objects and scanned images, useful for creating texture, bump, opacity, and other image maps.

To run this release, Autodesk suggests you have an 80386-based PC with 6MB of memory minimum. I used a 33MHz '486 computer with 48MB of RAM. Need I say more?



This image of a sunlit chapel interior uses 3D Studio Release 3 projection lighting, which was used to throw colored stained glass shadows into procedural smoke and layered fog.

Autodesk added so many features to the Materials Editor that it had to double the screen resolution to display all of them.

You'll want a powerful machine to take advantage of all the features Autodesk has added. Some of the more notable global program enhancements include built-in display support for 8-, 15-, and 24-bit true color; this minimizes the need for ADI (Autodesk Device Interface) drivers and allows the Materials Editor to display all of its sample windows in color, thus facilitating materials creation.

Another new feature is network rendering, which lets you queue animations and still images for rendering among as many as 9999 slaves per network. (Slaves don't require hardware keys, either.) With the Network Queue Manager, you can specify "start" and "stop," assign processes, and set the process order—for any member of the network.

Gamma control lets you adjust and configure the display, framebuffer, and file-gamma functions; together these functions preserve the maximum color fidelity, detail, and image quality of both animations and still images. This capability is extremely important (and rare in PC- and Mac-based 3D programs, I might add), because it assures that qualitative adjustments—both subtle and dramatic—made to the scene during the production process are accurately preserved and visible in the finished work.

Moving on to the lighting tools, here again Release 3 adds numerous new functions. For example, you can project any still or animated sequence through a spotlight, specify rectangular spotlights, and even ask for "negative" light, which selectively removes light; spotlights also may be dollied and rotated. Using these new features, you can effectively mimic traditional photographic lights and grip equipment, such as scrims, barn doors, gels, and mattes.

You also can position special-purpose lights, which affect only specific scene objects, with an exclude function (for both omni lights and spotlights). If you have something "dramatic" in mind, use the attenuate function (to simulate light falloff) in combination with shadow rendering for a rich yet natural look. Want to display an on-axis "camera" view—instantly—through any selected spotlight? Use the spotlight viewports function, which also lets you quickly adjust spotlight parameters. (The feedback is excellent, too.)

If you think the lighting tools are great, wait until you see the en-

hanced Materials Editor. In fact, so many features were added that the editor's screen resolution was doubled to a default resolution of 640 by 480, just to accommodate them. The editor lets you choose from eight different map types (each with masks), which then can be mixed, refined, and applied to a single material. New mapping types include specular, shininess, and self illumination. So not only can you now produce realistic-looking glass, you can also make that glass look cracked, smudged, or dirty. In addition, Release 3 adds a metal-shading mode and moves wire shading to its own special attribute. This allows hidden-line shading and see-through wireframe (with variable thickness) shading when the full array of mapping types is applied. Even the renderer is faster and provides improved quality over Release 2.

The Keyframer (3D Studio's animation module) now includes the ability to blur motion, hide/unhide objects, and insert animation tracks from a specified file object into the tracks of a scene object. Moreover, the insertion process lets you specify both the beginning point and the range of frames from the source object. In addition, you can now animate 3D Studio materials using morph options; this allows animation between any two materials of the same shading mode. For example: Shiny, Phong-shaded copper can be animated simply and smoothly to dull, dented, Phong-shaded silver.

With more than 200 new features, I obviously only could give a brief account of the extensive global and module-specific additions available in 3D Studio Release 3. But once again, Autodesk has demonstrated an unusual commitment to providing professional 3D illustrators and animators with an accessible, well-supported, and affordable tool. 3D Studio Release 3 costs $2995; current owners of Release 1 or 2 can upgrade for $497.—**Tim Forcade**, *a CGW contributing editor and president of Forcade & Associates, a multidisciplinary design and communications firm based in Lawrence, Kansas.*

CIRCLE 148 ON INFORMATION CARD

Smoothing Out the Edges

Ray Dream adds the option of resolution boosting to its anti-aliasing program

With the introduction of JAG II, Ray Dream Inc. (Mountain View, CA) has increased greatly the usefulness of its program for smoothing jagged edges. The initial release (December 1991), called JAG, took batches of jaggy color computer images and enhanced them via an anti-aliasing technique that adds color in between the jaggy areas: The result is smoother hard-color transitions. The new release, JAG II, adds yet another option for smoothing jaggies, a "resolution booster" that increases the number of pixels in an image.

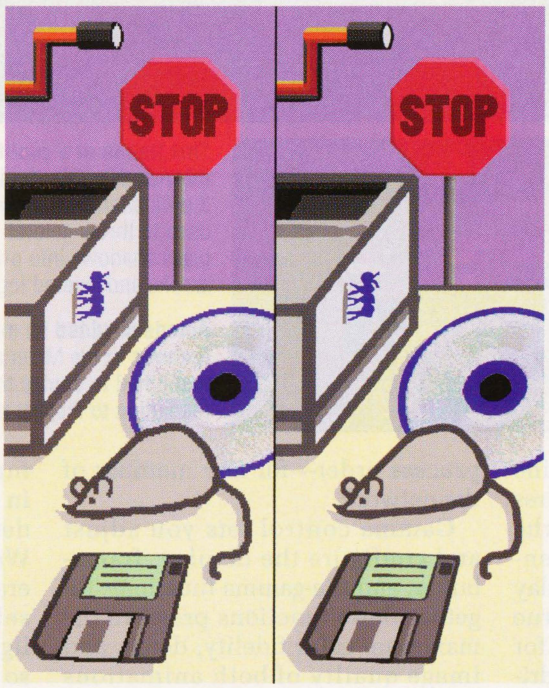
Although the original JAG was available for both Macintosh and Windows-based computers, JAG II runs on the Mac only. But the new program will handle black-and-white as well as color images, whereas JAG could handle color only. Support is provided for standard file still-image formats (EPS, PICT, TIFF, Photoshop), animation formats (PICS and QuickTime), and any format supported by Adobe Photoshop's plug-in modules (like Kodak's Photo CD).

From within JAG II, you can select rectangular and lasso areas to anti-alias. You also can choose "Easy Enhance," in which the computer determines how to enhance your image based on resolution and color. But for real control, you'll want to use the "Enhance" function, which offers a variety of options: You can choose the anti-alias function, with color depth from 1-bit black-and-white to 24-bit color; you can increase the resolution, to a maximum of 16,000-by-16,000 pixels per inch; or you can combine the two functions.

You also can use JAG II to downscale images if, for example, you wanted to send one as a fax. For instance, by decreasing the pixel depth from 256 colors to dithered black and white, and increasing the resolution from 72 to 200 dpi, you achieve an optimal fax resolution.

Ray Dream suggests that you determine from the start which enhancements you would like to apply. My tests confirmed that a separate increase of resolution followed by anti-aliasing did not produce as good an image as a one-step increase of resolution with anti-aliasing.

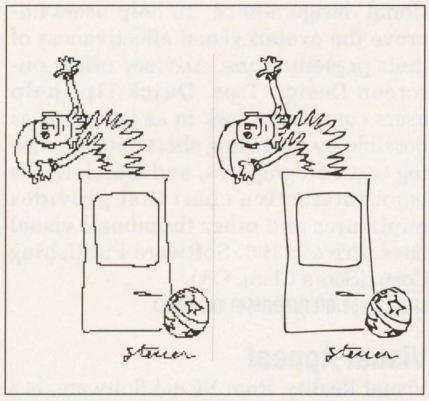
Another useful function is the built-in batch Queue, which can process full animations and folders of images, either individually or with default settings. The batch will process a number of files unattended while you work on another image or in another program, but you have to leave JAG II open and running in the background. If you quit, you'll lose your files. I found



By increasing the color depth via JAG II's anti-aliasing feature, users can change an image from one with jagged edges (left) to one that's more polished (right).

that the Queue works well in the background when anti-aliasing, but occupied too much of the processor's power when boosting the pixel resolution.

My only real complaint with this program, though, concerns its "save" command, which works differently (much to my chagrin) from the standard Macintosh "save" command. In the standard Mac environment, you type "save" and a dialog box appears on the screen, asking you to name the file and direct where to store it. While saving, the computer prevents you from performing another task until it has finished. JAG II, however, returns to the program as soon as you type "save," performing the task in the background.



The left-hand version shows an image before running JAG II; the right-hand image was enhanced using JAG II's resolution-boosting function.

Not knowing this, I quit JAG II, believing the program had already saved my image. The program did prompt me with an "I'm still processing" message, but I assumed it was processing something else that I didn't care about and quit anyway. Thus I lost the image, which luckily had taken only a half hour to render. The moral of the story? Be careful and make certain that your file is truly saved to your disk before quitting JAG II.

My last comment is more of a request. Although JAG II's edge detector is quite adept at interpreting sequences of pixels as curves or lines, I'd like more control over how the original lines should be interpreted (have "more curves" or "more corners") in a future release. I'd also like more control over selected portions of an image, such as the ability to specify more curves when anti-aliasing organic objects or more corners when anti-aliasing geometric shapes. For example, when creating an image of a jack-in-the-box, the toy's eye looked more square than I would have liked; if these features were included, I (hopefully) could have fixed this.

With JAG II, you'll still need to touch up your final pieces. But at $129, the program is an economical and useful utility that may be just the thing you need for smoothing out the edges of a jaggy project.

—Sharon Steuer, *a consultant and freelance computer graphic artist based in Bethany, Connecticut.*

CIRCLE 149 ON INFORMATION CARD

how to make a

BIG SPLASH!

in instant printing.

With a large format digital printing system from Raster Graphics, you can produce big, brilliant, four-color posters, displays, signage, and presentation graphics.

On demand...In minutes... at a cost that makes sense, *even for runs of one*!

Our system is compatible with most desktop publishing systems, will handle **PostScript**® Level 2 printing, scanned images, and — believe it or not — works beautifully in any office environment.

So whether you want to make points with your boss or with your customers, the Raster Graphics digital printing system could be a big winner for you.

For more information call: **(800) 441-4788** or send us a fax **(408) 749-0544.**

RASTERGRAPHICS

285 North Wolfe Road • Sunnyvale, CA • 94086

PostScript is a trademark of Adobe Systems, Incorporated, which may be registered in certain jurisdictions.

CIRCLE 45 ON INFORMATION CARD

PRODUCTS

Dive into Video

Release 2.0 of Charybda's Diver (Digital Image and Video Encoder and Reformatter) software for Unix workstations reads and writes digital video formats to and from tape without requiring special hardware. The package also translates image files from 12 different formats and lets animators rename, renumber, and repad sequences of images. Diver reads and writes tapes compatible with the entire line of Abekas digital disk recorders. Users can perform digital video recording and frame grabbing in both PAL and NTSC. Price: $1500. Charybda (Ranchos de Taos, NM).

CIRCLE 151 ON INFORMATION CARD

Desktop Video Production

Release 2.0 of the Media Suite Pro desktop video production system from Avid Technology includes a 60-field option, the option of outputting an edit decision list, and motion-control and user-definable picture-in-picture effects, among others. An upgrade path is available for Media Suite Pro users requiring more specialized Media Composer functionality. Media Suite Pro 2.0 is expected to ship sometime this fall. Price: $9995. Avid Technology Inc. (Tewksbury, MA).

CIRCLE 152 ON INFORMATION CARD

Morphing and Warping

With the latest release of Gryphon Software's Morph special effects program—Morph 2.0 for the Mac—users can create caricatures of as well as warp both still and moving images and choose specific features or areas within a still image to distort. For video professionals, the product supports field rendering for higher-quality video output. Alpha channelling is also supported, so users can isolate animation components during the editing process. Price: $239. Gryphon Software Corp. (San Diego).

CIRCLE 153 ON INFORMATION CARD

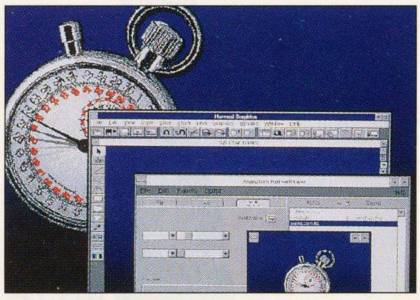
Enhanced Animation

Version 3.02 of Thomson Digital Image's Explore and TDImage software features new character animation capabilities, increased rendering speed, and other improvements in modeling, image editing, and software integration. For instance, character animation can now be created using inverse and forward kinematics, and the software gives animators full 3D control over the orientation of any segment within a skeletal structure. In addition, spline fitting is now either flexible or hard, and new rotoscoping capabilities let users display live video and 3D animation simultaneously while controlling the action of both with a single slider. As for rendering, the software now offers depth-of-field for simulating the view of an actual camera as well as 16-bit rendering for output to high-quality film. As of press time, TDI and Wavefront Technologies Inc. had announced—but not yet finalized—plans to merge. Once the transaction has been finalized, all TDI software will be available through Wavefront Technologies (Santa Barbara, CA).

CIRCLE 154 ON INFORMATION CARD

Autodesk Animation

The Multimedia Division of Autodesk has introduced Animation Partner, a trio of Windows-based animation "applets"



which enable PC users to add 3D animation and sound to a variety of Windows-based business applications. Complete with playing and editing features, the Animation Partner/Player module integrates animations and sounds into the primary application and enables their playback over a period of time. Animation Partner/Clips consists of pre-created clip animations and sounds for inclusion within primary application programs. When installed within certain primary applications, Animation Partner/Chartfx creates animations of numerical data. Price: $129.99 for all three modules. Autodesk (Sausalito, CA).

CIRCLE 155 ON INFORMATION CARD

Distorted Images

Metaflo' is a new image synthesis and plasticity program that lets users turn independent image layers into separate pliable rubber canvases that can be stretched, distorted, merged with other images, animated, and morphed without degrading the original image quality. Available from The Valis Group, the program also lets users morph between layers or combine morphing with distortion effects. Users save their work as an intelligent Metaflo' document with an associated image catalog of various user-defined states of an image for future use or for creating animations. The program also allows unlimited hierarchical undo and redo of effects. Price: $595. The Valis Group (Point Richmond, CA).

CIRCLE 156 ON INFORMATION CARD

Presentation Advisor

To boost users' productivity and deliver greater ease of use, efficiency, and effectiveness throughout the entire presentation process, Software Publishing Corp.'s Harvard Graphics 2.0 for Windows now features Advisor, a tool that provides users with content assistance and professional design advice. To help users improve the overall visual effectiveness of their presentations, Advisor offers on-screen Design Tips. Quick Tips help users complete a task in as few steps as possible by providing short-cuts for editing text and graphics, and Quick Looks is an interactive chart that provides miniatures and other thumbnail visual cues. Price: $395. Software Publishing Corp. (Santa Clara, CA).

CIRCLE 157 ON INFORMATION CARD

Visual Appeal

Visual Reality, from Visual Software, is a suite of products for the creation of photorealistic images and motion sequences. Running on PCs under Microsoft Windows, Visual Reality provides a library of 3D models as well as tools for modeling, rendering, camera animation, and image composition. Central to the creation of realistic 3D images in this product is the company's Renderize for Windows. For creating 3D models, a Visual Model module provides basic building blocks such as spheres, polygons, and cubes. Other modeling functions such as splines, cut, extrusion, and surface of revolution are also available. Once a model is built and a rendered scene is completed, the program produces quality walkthrough and fly-by sequences in the Renderize Live camera animation module. The Visual Reality suite of products was expected to begin shipping last month. Price: $595. Visual Software Inc. (Woodland Hills, CA).

CIRCLE 158 ON INFORMATION CARD

Coloring Cartoons

Targeted at cartoon coloring and compositing applications, Parallax Software Inc.'s DIPS (Digital Ink and Paint System) uses a "revolutionary" method for vectorizing hand-drawn images. After the user scans in the original cartoon drawing, the system outlines each shape, saving the resulting form as a vector that the user can color by simply selecting a hue and clicking on each shape that has that color. DIPS tracks the motion of the same area or character on subsequent frames and automatically colors them according to the first color set-up. The resolution-independent program outputs animations to either video or film and runs on general-

purpose Silicon Graphics workstations. Parallax Software Inc. (New York).
CIRCLE 159 IN INFORMATION CARD

Multimedia Madness

IBM has introduced three software products for its OS/2 2.1 operating system: Ultimedia Builder/2, an easy-to-use multimedia presentation development package; Ultimedia Perfect Image/2 image processing and enhancement software; and Ultimedia Workplace/2, which links multimedia information and databases. All three products require a PC running OS/2 2.1 with MMPM/2 (multimedia extensions for Presentation Manager) and a CD-ROM drive or one 3.5-inch disk drive for installation. Price: $345 (Builder/2 and Workplace/2); $175 (Perfect Image/2). IBM's Personal Software Products (White Plains, NY).
CIRCLE 160 ON INFORMATION CARD

Composing in ShowPlace

Accepting DXF as well as RIB models, ShowPlace Version 2.0—the latest version of Pixar's picture composition software for the Macintosh—also supports an open environment for the development of RIB plug-ins, mini-applications accessible directly from the ShowPlace menu which generate many different editable models. Some of the editable models included with ShowPlace 2.0 are fractal terrain, text, venetian blinds, rooms, stairs, abstract designs, and particles. This latest version also offers an expanded collection of pre-designed ClipObjects including shapes, symbols, and signs. Price: $695. Pixar (Point Richmond, CA).
CIRCLE 161 ON INFORMATION CARD

Output

CAD Plotting

Available from Pacific Data Products are ProTracer II and ProTracer II-GL, two personal CAD plotters which combine an Intel i960 RISC-based controller and a high-performance Canon ink-jet engine to produce letter-quality C-size drawings at 360 dpi. ProTracer II, designed for AutoCAD users, provides resident Epson LQ-1050 and IBM ProPrinter XL24E emulations, 512KB of memory, custom device interface drivers for AutoCAD Releases 10 through 12, and a C-size Windows driver. ProTracer II-GL adds to these features resident HP-GL and HP-GL/2 emulation and 2MB of memory. Price: $1599 (ProTracer II); $2149 (ProTracer II-GL). Pacific Data Products (San Diego).
CIRCLE 162 ON INFORMATION CARD

Network Color Printers

Seiko Instruments' new network color thermal wax printers—the ColorPoint PSN Models 4 and 14—feature built-in PostScript Level 2 compatibility and utilize an Intel 33MHz 80960CA processor. Model 4 is designed for A-size output; model 14 for B-size output. Both printers support color management software, including EfiColor, Apple ColorSync, and Kodak ColorSense, and offer a choice of user-selectable color balancing tables. Price: $5999 (Model 4); $8999 (Model 14). Seiko Instruments USA Inc. (San Jose, CA).
CIRCLE 163 ON INFORMATION CARD

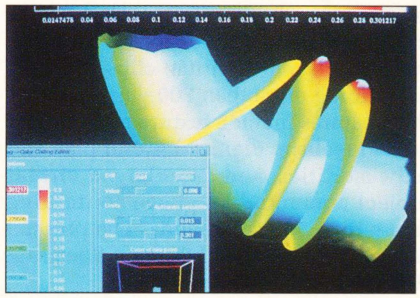
Science & Medicine

Scientific Imaging

Image-Pro Plus for Windows from Media Cybernetics is a high-end image processing program for scientific imaging. A main part of the product is a multiplatform developers toolkit called Halo Advanced Imaging Library (HAIL), which lets users capture and process images, make manual and automatic measurements and classifications, define areas of interest, extract individual color channels, process and then merge them back into the original image, analyze histograms and line profiles, perform JPEG compression, and save data and objects in a variety of formats. The program supports 12-bit grayscale and floating-point image classes as well as Photo CD and TWAIN scanners and offers, among other features, watershed segmentation and a new visual image file management interface called Gallery. Price: $1999. Media Cybernetics Inc. (Silver Spring, MD).
CIRCLE 164 ON INFORMATION CARD

3D Visualization

Key features of Uniras' DirectInsight 3D visualization software include a new visualization architecture paradigm, called



Steering, and a Spaceball input device that lets users explore large 3D and 4D data sets on-the-fly. The steering architecture enables real-time input, display, analysis, and animation of 2D, 3D, and 4D data sets and redefines the way data is processed to create visual representations. Users generate 3D images of data

CIRCLE 46 ON INFORMATION CARD

by moving the Spaceball input device around the screen. The program automatically and in real time renders and displays the underlying data as the Spaceball moves across it. The Unix-based program costs $9900. Uniras Inc. (Dallas).

CIRCLE 165 ON INFORMATION CARD

Super VR

Designed for virtual world building on industry-standard '486 PCs, Superscape VRT3 from UK-based Dimension International provides fast interactive 3D visualization, an easy-to-use GUI, seven integrated editors, 20 detailed virtual environments, and a virtual clip-art library containing more than 200 objects. Other key features include texture mapping for added realism, digitized sound play and edit facilities, and an enlarged virtual object command language containing more than 500 commands. The product is available in the US through Spectrum Dynamics (Houston).

CIRCLE 166 ON INFORMATION CARD

Windows VR

Sense8 has announced WorldToolKit for Windows, a software tool for building real-time virtual reality and graphics simulation applications for business and professional use. The product easily links to mainstream, data-rich applications such as Microsoft Excel to present new ways of viewing and interacting with data. For example, users can present abstract information from a simple spreadsheet in a 3D virtual "room," where elements move or change colors to reflect changes in the data; to see views that are not apparent on the spreadsheet, users navigate around the room. The product is scheduled for release in December. Price: $795. Sense8 Corp. (Sausalito, CA).

CIRCLE 167 ON INFORMATION CARD

PRODUCTS

Board Level

Fast Graphics Interface

Radius has designed its PrecisionColor Pro 24XP accelerated Macintosh display interface in a 7-inch NuBus form factor for complete compatibility with all NuBus-based Mac systems, including the Centris 610. The interface offers Dynamic Desktop software, which lets users switch resolutions and bit-depths on-the-fly without having to reboot their system or re-launch applications. Users can switch to a variety of resolutions, including 832 by 624 and 640 by 480, and between various bit depths, including monochrome, 8 bit, and 24 bit. Price: $599. Radius Inc. (San Jose, CA).

CIRCLE 168 ON INFORMATION CARD

MPEG Video Encoder

XingIt, Xing Technology's 30-frame-per-second MPEG video encoder board for PCs, features real-time video capture, filtering, and MPEG compression plus software-only MPEG video playback through Microsoft Video for Windows, synchronized with WAV or MPEG audio. Jointly designed by Xing and Philips Semiconductor, the board combines Xing's software and digital design technology with Philips' digital video integrated circuit technology for video capture, scaling, and filtering. XingIt operates with Intel '386, '486, and Pentium-compatible ISA bus PCs. Price: $795. Xing Technology (Arroyo Grande, CA).

CIRCLE 169 ON INFORMATION CARD

Full-Motion Digital Video

RasterOps' MoviePak2 is a video compression/decompression daughterboard offering full-motion (60 fields per second), real-time (30 frames per second) video digitizing and full-screen (640 by 480) playback from the hard disk.

MoviePak2 snaps onto RasterOps' video display adapters so users can record, edit, and play back QuickTime movies on the desktop. It uses the same LSI Logic JPEG technology as the original MoviePak, but integrates faster components that can process four times the video data and features user-selectable variable compression ratios from 2:1 up to 100:1. MoviePak2 is expected to be available this month. Price: $1999. RasterOps (Santa Clara, CA).

CIRCLE 170 ON INFORMATION CARD

Graphics at "Warp" Speed

Based on the IIT graphics engine, the new Volante Warp20 accelerator board for Windows and CAD graphics functions offers non-interlaced resolutions up to 1280 by 1024. It also improves the quality of images with photorealistic pictures in 16.7 million colors with 1MB of VRAM at 640 by 480 and 65,536 colors at 800 by 600. With 2MB of VRAM, users have access to 65,536 colors from a palette of 16.7 million at 1024 by 768. Price: $399 (1MB of VRAM); $499 (2MB of VRAM). NDI Volante (Austin, TX).

CIRCLE 171 ON INFORMATION CARD

Video Boards for Sun

From Parallax Graphics, PowerVideo is a single-slot S-Bus board with 24-bit color and hardware compression/decompression for applications such as video conferencing. MultiVideo, also a single-slot S-Bus board, is designed for 24-bit color applications that do not require compression, such as frame grabbing from analog video inputs. Both products are used with third-party software applications or with VideoTool, Parallax's multimedia application. The Parallax Video Development Environment is for developers who want to write custom applications for the two new hardware products. Price: $5495 (PowerVideo); $2995 (MultiVideo). Parallax Graphics (Santa Clara, CA).

CIRCLE 172 ON INFORMATION CARD

Miscellaneous

Desktop Conferencing

InPerson, a desktop conferencing program designed for Silicon Graphics workstations, combines SGI's digital media hardware with its Indigo Magic user environment. When run on an SGI Indy desktop system, which comes with a color digital video camera, InPerson requires no additional hardware for professional-quality audio and video capabilities—users can share high-quality audio, video, text, images, and 3D models in real time over standard network connections. InPerson is application-independent so users can import an image for review and mark-up from any application window. Multiple applications can be used to review, capture, and include data in the conference. InPerson is expected to be available for the Indy and Indigo2 systems in December. Price: $495 (single-user license). Silicon Graphics (Mountain View, CA).

CIRCLE 173 ON INFORMATION CARD

Digital Assistance

Sharp's new PI-7000 Expert Pad is a licensed personal digital assistant based on Apple's Newton Intelligence. To anticipate a user's needs, the unit actively adapts itself to the user's work habits; it also personalizes information, recognizes graphical patterns as well as cursive script, block letters, or a mixture of both, and will learn a user's handwriting. Online services, computer networks, pagers, and other communications systems facilitate the communication of information, ideas, and messages. Price: $899. Sharp Electronics Corp. (Mahwah, NJ).

CIRCLE 174 ON INFORMATION CARD

SGI Disk Arrays

The Spectra 6000, a new disk array custom-designed for Silicon Graphics workstations, is now available from Ciprico. The Spectra 6000 couples parallel data transfers with high-speed SCSI-2

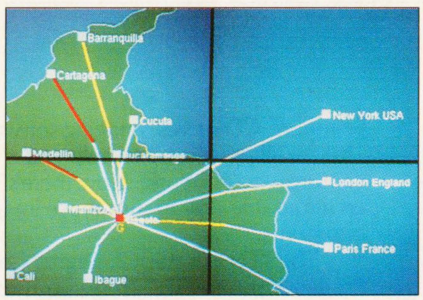
drives and a custom-designed Irix driver, resulting in a maximum data-transfer rate on Onyx or Challenge systems in excess of 17MB per second. The disk array features hot drive replacement and can be configured with either five or nine 3.5-inch SCSI-2 drives, providing storage capacity up to 16GB. Price: $23,275 (five-drive version with 4.2GB of data); $35,325 (nine-drive version with 8.4GB of data). Ciprico Inc. (Plymouth, MN).
CIRCLE 175 ON INFORMATION CARD

Prowling for Pictures

Picture Prowler from Xing Technology instantly captures, compresses, and organizes thousands of color and grayscale images, then creates thumbnail sketches of JPEG images and decompresses them for fast, real-time, full-screen viewing. Interactive thumbnail scrolling provides quick visual search and retrieval; keyword, filename, directory, and hard-disk searches are also supported. With Picture Prowler's file association feature, users can catalog and play back video and audio files. Price: $89.95. Xing Technology Corp. (Arroyo Grande, CA).
CIRCLE 176 ON INFORMATION CARD

Splitting Signals

Designed for control room, simulation, and trade-show applications, RGB Spectrum's computer signal splitter uses a

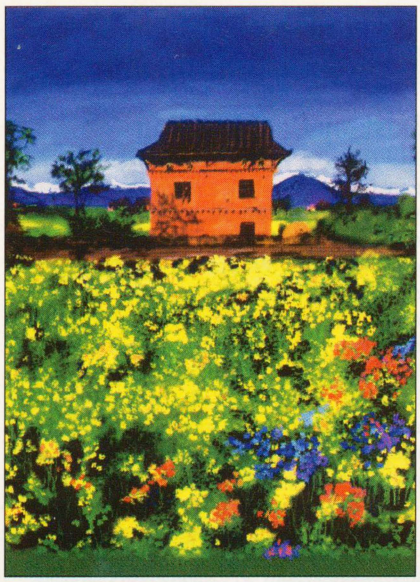


mosaic technique to divide a signal over multiple projectors or monitors, providing bright, large-screen displays. The splitter splits a digital image of up to 1280-by-1024 resolution over four or 16 display devices, each containing ¼ or 1/16 of the original image. Connecting to a workstation via Ethernet, the splitter operates in two modes: an X-terminal emulation mode that uses a PC as an X terminal, and a "demon" mode in which a resident program automatically sends the workstation screen display to the splitter. Video compression software minimizes the load on network resources. RGB Spectrum (Alameda, CA).
CIRCLE 177 ON INFORMATION CARD

Graphic Arts

Pleasure Painting

The PC-based Fauve Matisse paint program from Fauve Software features multitipped oil brushes, drag and drop image objects, editable shapes, user-defined textures, and variable brush smoothing and blackness control. According to the company, the brushes available within the program realistically simulate pencils, calligraphy pens, felt-tip markers, charcoals, oils, watercolors, and other media. Users can modify individual brushes by changing any number of parameters,



ranging from angle to texture and including blackness, soft edge, and grain. Real-time antialiasing and brushstroke smoothing capabilities help users create perfect strokes with a regular mouse or tablet. The program's object-oriented design allows for multiple floating sections or image objects in a window at a given time. Price: $399. Fauve Software Inc. (Cary, NC).
CIRCLE 178 ON INFORMATION CARD

Design Engineering

Illustrative Rendering

KaTy, from 5-D Solutions Ltd., is a software system for "illustrative" 3D rendering and 2D image post-processing in product marketing and documentation applications. The product consists of two major subsystems. The KaTy subsystem reads three-dimensional geometric data in a number of formats, assembles the 3D components into a scene, assigns attributes to the components, and then renders views of the scene to image files. The KaTy/fx subsystem reads image files from any source and re-creates the image contents in styles defined in terms of brushes, color transformations, and the characteristics of the type of paper on which the original image is redrawn. Price: $4950. 5-D Solutions Ltd. (London).
CIRCLE 179 ON INFORMATION CARD

Macintosh Drawing

Claris Corp. has based its new ClarisDraw for the Macintosh program on a new code architecture called Claris Graphics Engine (CGE), which reportedly delivers high performance and seamless cross-platform transparency for both Macintosh and Windows users. New features in ClarisDraw for the Macintosh include comprehensive drawing tools including lines, rectangles, ovals, polygons, arcs, notes, and beziers; tear-off tool palettes that provide one-click access to 100 fill patterns; three types of customizable gradient fills; 256 customizable colors; a choice of line patterns and widths; and a 3400-piece SmartSymbol library. Price: $399. Claris Corporation (Santa Clara, CA).
CIRCLE 180 ON INFORMATION CARD

Updated Topas Pro

New features in version 5.0 of CrystalGraphics' Topas Professional include network rendering and a 2D/3D clip-art CD-ROM. Offering dynamic intelligence, the new rendering system includes a Windows-based master node that automatically schedules and distributes multiple animations and high-resolution renders across client/server or peer-to-peer networks. Rendering jobs can be submitted from any Topas node on the network and rendered on an unlimited number of nodes, according to the company. Called Crystal GEms, the new CD-ROM contains hundreds of megabytes of high-quality background pictures, texture and reflection maps, models, rendered images, and movies that users can incorporate into their applications. Version 5.0 also features a perspective matching tool. CrystalGraphics Inc. (Santa Clara, CA).
CIRCLE 181 ON INFORMATION CARD

Expert-Level 3D

Targeted at 3D design and animation professionals, Strata's StudioPro program includes a spline-based 3D Sculptor, RayPainter rendering technology, and an event-based animation system. With the 3D Sculptor, users create shapes that are soft and pliable, like virtual clay. Using RayPainter, users create images that look as if they were hand-rendered using traditional media, with brushstrokes that follow the surface of each object. StudioPro's special-effects extensions let users explode, shatter, and atomize their animations. Other animation extensions include bounce, ease-in/ease-out, auto-bank, and point-at. Strata Inc. (St. George, UT).
CIRCLE 182 ON INFORMATION CARD

Show them & sell them in *CGW*'s Showcase

Put your product in the spotlight with *Computer Graphics World*'s Showcase advertising section. It's the perfect place to start your ad campaign for the computer graphics market and build visibility for your company or product.

To participate in CGW's Showcase, advertisers must submit a proof with the following:

▼ One 35mm slide or four-color transparency of product, or computer-generated art on a Mac disk,

▼ 75 words of ad copy, brief headline and contact address with phone number,

▼ or complete film for the unit.

Copy and illustration must fit within $3\frac{1}{3} \times 4\frac{5}{8}$".

Each Showcase unit features one photograph or piece of artwork.

Insertion order and materials must be received no later than the first of the month preceding issue date.

COMPUTER GRAPHICS WORLD

First time advertisers must submit full payment with materials.

Showcase Advertising Rates
(4/C each insertion)

Frequency	Rate
1×	$1750
3×	$1675
6×	$1600
12×	$1525

To place your ad, call Shirley Athorn at (508)392-2183.

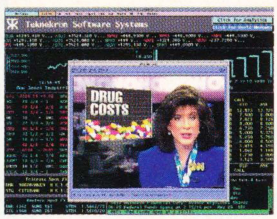
* Showcase ads are non-commisssionable

SHOWCASE

RASTERFLEX™ by VITec

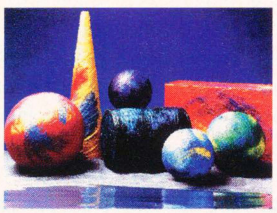
SUPPORTS OS 4.1.X AND SOLARIS 2.X

NEW! NEW!
RASTERFLEX-TV™
- Real-time Video Display
- Freeze Frame Capabilities
- Frame Grabbing
- Onscreen Controls
- Single-slot SBus Card



Video-in-a-Window for Sun SPARCstations™

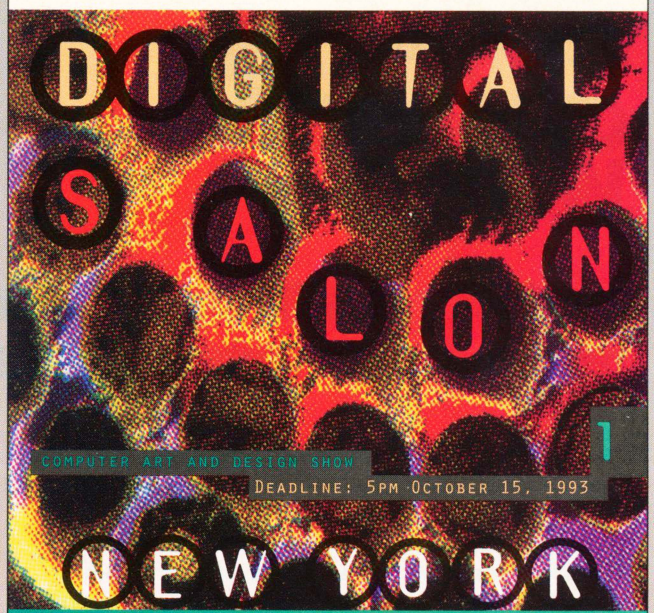
RASTERFLEX-32™
True Color Accelerator
- Single-Slot SBus Card
- Simultaneous Display of 8 and 24-bit Applications
- Multiple Color Palettes to Alleviate Color Flashing
- 1152 x 900 Resolution
- Also Available: RASTERFLEX-HR™ for 1280 x 1024 Resolution


Accelerated True Color for Sun SPARCstations

VITec
Visual Information Technologies Incorporated
3460 Lotus Drive • Plano, Texas 75075
800-325-6467 x 433 or 214-596-5600 • Fax 214-867-4489
VITec Europe Ltd. • 44 (0) 256 330030 • Fax 44 (0) 256 816978

UNIX IMAGING EXPERTS SINCE 1986

CIRCLE 101 ON INFORMATION CARD



SPONSORED BY: NYC ACM/SIGGRAPH, INSTITUTE FOR COMPUTERS IN THE ARTS, SCHOOL OF VISUAL ARTS, AND COMPUTER ARTIST MAGAZINE SALON CHAIR: TIMOTHY BINKLEY CURATOR: BRUCE WANDS JURORS: BARBARA NESSIM JUDSON ROSEBUSH LILLIAN SCHWARTZ KENNETH SNELSON THIS JURIED EXHIBITION OF COMPUTER ART WILL BE HELD AT THE ART DIRECTORS CLUB IN NEW YORK CITY, DECEMBER 6-17. FOR MORE INFORMATION CALL: TIMOTHY BINKLEY, INSTITUTE FOR COMPUTERS IN THE ARTS, SCHOOL OF VISUAL ARTS, 209 E. 23RD ST., NEW YORK, NY 10010, (212) 592-2535, FAX: (212) 725-3587.EMAIL: BINKLEY @SVA.EDU

© 1993 VISUAL ARTS PRESS LTD. DESIGN: NANCY MAZZEI COMPUTER SILKSCREEN: DIANA STONE

CIRCLE 102 ON INFORMATION CARD

SHOWCASE

6th GOVERNMENT PUBLISHERS SEMINAR

November 16, 1993 • Washington, DC

Here is your primary opportunity to learn first-hand about the technologies and the management issues for publishing in all its forms specifically for government applications. This seminar will help to bring government publishing specialists together to share information and review alternatives.

As desktop publishing use grows, with stronger links to office automation, we will be forced to re-evaluate systems approaches.

Frank Romano, editor-in-chief of *Electronic Publishing*, presents a unique blend of consultant, vendor and user perspectives to allow maximum information sharing in a minimum amount of time. Attendance will be limited to permit audience and speaker interaction.

Sponsored by:

ELECTRONIC PUBLISHING
And TypeWorld A PennWell Publication

Call 508-392-2187 now for a free seminar brochure!

CIRCLE 103 ON INFORMATION CARD

WINDOWS COMPATIBLE

The ONLY hands-on tutorial software for AutoCAD® users.

AutoPACK Tutor is the only hands-on tutorial software designed for novice and advanced AutoCAD users, self-taught and formally instructed. Tutor software provides an introduction to the basic concepts, elements, and standards of AutoCAD. Tutor also expands your existing knowledge of AutoCAD with an on-line help system superior to AutoCAD's own help files. With these two components of Tutor, learning AutoCAD is simple and easy. ***Call now to Order!***

1-800-239-3CAD

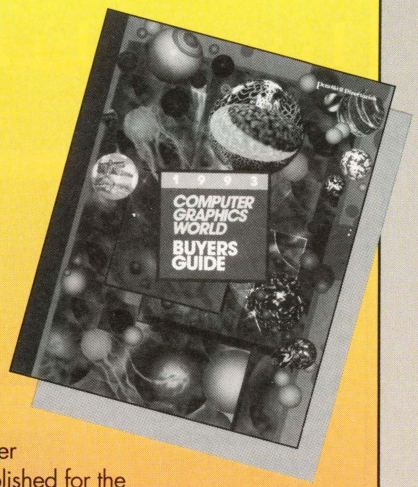
When it comes to Computer Based Training for AutoCAD, AutoPACK Tutor isn't everything, it's the only thing.

AUTOPACK SOFTWARE BY Gräbert SYSTEMHAUS

FAX 602.9514592 • 8283 N. Hayden Road, Suite 250 • Scottsdale, AZ 85258

CIRCLE 104 ON INFORMATION CARD

COMPUTER GRAPHICS WORLD



provides you with the most comprehensive resource of computer graphics suppliers!

▼ The 1993 ***Computer Graphics World Buyers Guide*** has been completely researched and revised to give you the very latest products and services available in today's computer graphics marketplace. It has been completely updated 100% for this edition. It gives you the depth and breadth you need to stay ahead of the fastest moving segment of the computer industry.

▼ Indicates vital information including address, telephone number, markets served, services offered, application areas served, price, operating systems, system requirements, product descriptions, and other pertinent information.

▼ Includes over 1,000 graphics resources worldwide.

▼ This is the only computer graphics ***Buyers Guide*** published for the industry this year. A must for anyone recommending or specifying hardware and software who wants to save time and money.

Call or fax for more information:
Computer Graphics World Buyers Guide
PennWell Publishing
Tulsa, OK 74121
Tel: 1-800-752-9764; Fax: 1-918-831-9555

Domestic: $95.00;
International: $125.00

SHOWCASE

Candela Color Management System (CCMS)

The CCMS is a color toolbox for software developers. You can create 3-D, non-linear, non-separable color transformations that are necessary for high-end color correction. This comprehensive library of C callable routines, color transformations, gamut mapping functions, image test targets and clearly written API is all you need to solve complex color calibration and color matching problems. You can produce Candela ColorCircuits™ for the highest precision-speed transformations or create Color Rendering Dictionaries for compatibility with ADOBE Postscript Level 2. The CCMS is Available for most ANSI C supported environments. An 85 page API is available FREE to qualified developers.

(612) 894-8890

CANDELA

1676 East Cliff Rd
Burnsville, MN 55337-1300

CIRCLE 107 ON INFORMATION CARD

Featuring
products,
employment opportunities
services, systems
& software.

VANCOUVER FILM SCHOOL

presents:

3D COMPUTER GRAPHICS ANIMATION

This 12 month program is the most comprehensive of its kind in North America and is a full immersion into computer graphics animation. The classes are integrated with a high-end commercial production company and graduates achieve a widely adaptable range of computer skills.

Highlights include:

- ★ Low student-equipment ratio
- ★ 2,000 + hours of training
- ★ Wide range of industry software
- ★ Theoretical/practical experience
- ★ Highly skilled instructors
- ★ State-of-the-art workstations
- ★ A completed portfolio

We also offer an intensive foundation program in 16mm film production. For information call or write:

Vancouver Film School
400 - 1168 Hamilton St.
Vancouver. B.C.
Canada V6B 2S2

604 685-5808
Fax: 685-5830

hyperSPACE™

The world's leading 3-D digitizing and modeling system.

Fast • Powerful
Easy to Use.

Supports most 3-D file formats.

Call toll-free 800 950-6472 or
801 466-4641 • Fax 801 466-4699

Mira Imaging

MIRA IMAGING, INC. • 2257 SOUTH 1100 EAST SUITE 1A • SALT LAKE CITY, UTAH 84106

FOR INFO, CIRCLE 108; FOR DEALER INFO, CIRCLE 109 ON INFORMATION CARD

American center for Computer Imaging & Animation

Why is one school setting a world standard for Computer Animation Training?

You'll find the latest SGI gear, SoftImage, Betacam and all of the real names in animation here plus students from around the world in our two locations—Minneapolis & Raleigh.

800 800-2835
Fax 612 721-6642

school of communication arts
2526 27th Avenue South
Minneapolis, MN 55406

CIRCLE 110 ON INFORMATION CARD

Photocomposition with workstation performance on a PC.

Photocomposition courtesy of Greg Dawson

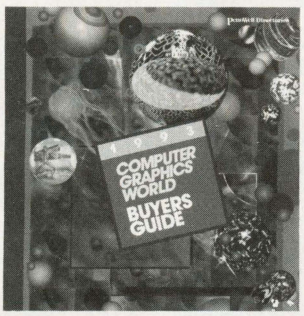
Unrivaled speed. Complex darkroom tools. Sophisticated drawing and type handling. Precision editing tools. Dazzling special effects. All these features and more come together in a clean and intuitive interface to make **HiRes QFX** one of the most powerful photocomposition programs on any platform. Yet **HiRes QFX** is surprisingly affordable. For more information, or for a free demo disk and brochure, call us at **(713) 529-5868.**

HiRes QFX
Ron Scott Inc.
1000 Jackson Blvd. Houston, Tx 77006

CIRCLE 111 ON INFORMATION CARD

ORDER YOUR *Computer Graphics World* BUYERS GUIDE NOW!!!

100% updated for this edition



CIRCLE 112 ON INFORMATION CARD

SHOWCASE

COMPUTER GRAPHICS WORLD REPRINTS

Call Becky Biggar at (508) 392-2157 to order yours, today!

COMPUTER GRAPHICS WORLD GRAPHICS SHOWCASE

is the ideal, low-cost solution for generating high-quality sales leads from over 200,000 industry professionals.

Use Graphics Showcase to:

- introduce a new product
- test a market
- promote a bulletin
- special reports
- sell a video
- announce employment opportunities

Please send camera-ready logo or black-and-white photo (3" × 5" or 5" × 7") and 60 words of copy. We'll do the rest.

For rates and information, contact:

Shirley Athorn
Computer Graphics World
One Technology Park Drive
P.O. Box 987
Westford, MA 01886-9940

Tel: (508)392-2183
Fax: (508) 692-8391

DIGITAL OUTPUT SERVICES

HIGHEST QUALITY • 24 HOUR TURNAROUND TIME
4"x 5" & 8" x 10" COLOR CHROME OUTPUT
HIGH QUALITY IRIS OUTPUT

ACCEPT TIFF, TARGA, POSTSCRIPT, PHOTOSHOP, ALIAS, COREL DRAW, EVANS & SUTHERLAND, GIG, WAVEFRONT, INTERGRAPH, SOFT IMAGE & SCITEX

advance reproductions corporation

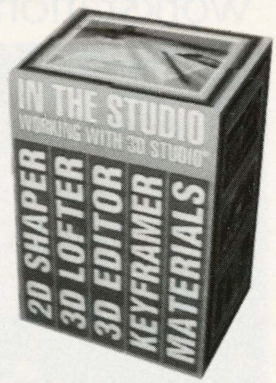
100 FLAGSHIP DRIVE • NORTH ANDOVER, MA 01845 • TEL: (508) 685-2911 • FAX: (508) 685-1771

CIRCLE 113 ON INFORMATION CARD

3D STUDIO VIDEOS

IN THE STUDIO

IN THE STUDIO is the highly acclaimed video tutorial set that can quickly bring you up to speed. The five, one our tapes, cover all aspects of 3DS. **$295 VHS $395 PAL** *Plus S & H*



VIDEO POST

This one hour tape covers every aspect of **VIDEO POST,** one of the most powerful features of 3DS. Learn to do transitions, rotoscoping, IPAS effects and more.

$79.95 VHS $99.95 PAL *Plus S & H*

AUTODESK REGISTERED DEVELOPER

DIGIMATION
315 St. Anthony St. Luling, LA 70070
(504) 785-3969 800-854-4496

CIRCLE 114 ON INFORMATION CARD

PROTECT YOUR INVESTMENT

Who will provide support for your program with AT&T/GSL out of business? What will you do when your lock is lost, stolen or damaged and can't be replaced?

Our SAFEKEY software programs are guaranteed to UNLOCK the following:

TOPAS	RIO	PANORAMA
INSCRIBER	LUMENA	3D-STUDIO
IMAGEPAINT	D.G.S.	VISTA TIPS
LOGO EDITOR	RTX	AND MORE

CAD SAFEKEYS TOO

AUTOCAD	CADKEY	TANGO PCB
MASTERCAM	PADS 2000	MAXROUTE
MICROSTATION	SMARTCAM	AND MORE

As low $300 plus S&H

Special Unlock HI-RES QFX for $125

NEW THE PC-KEY

IF YOUR PROGRAM USES A LOCK BY RAINBOW TECHNOLOGIES INC. TRY THE PC-KEY- A PROGRAMABLE 8-BIT BOARD THAT REPLACES YOUR LOCK ELECTRONICALLY!

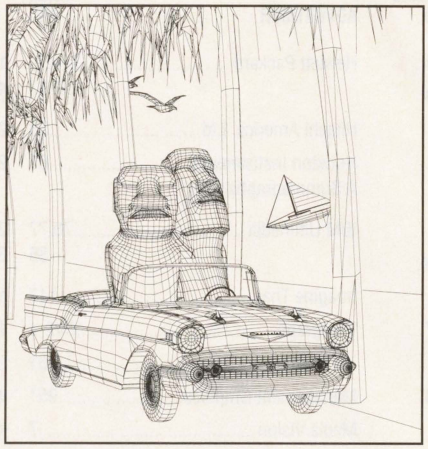
AMERICAN EXPRESS (609) 390-2799
(609) 390-3750 FAX

IMAGINE THAT
1 EVERGREEN DR., SEAVILLE, NJ 08230

Products are for licensed users only
Trademarks are the property of respective owners

CIRCLE 117 ON INFORMATION CARD

Make Us Part of Your Reality



3D Data for Your Interactive Environment

From 100 to 100,000 polygons, Viewpoint can meet the demands of your 3D application. Cars, boats, planes, people, animals and more are available in most 3D software formats.

Choose from hundreds of pre-built Datasets in our 200 page catalog, or call us for custom digitizing. Save time. Save money. Let Viewpoint be part of your reality.

CALL 1.800.DATASET for you free catalog!

VIEWPOINT DATALABS

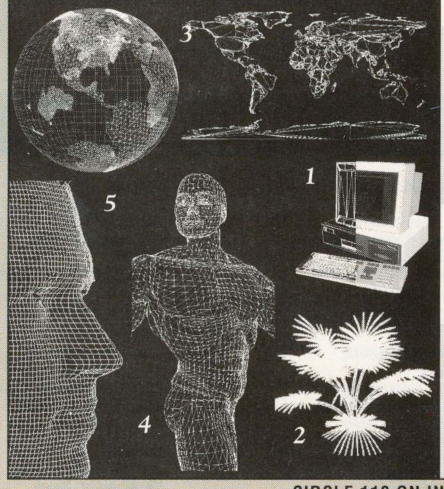
Ph 801.224.2222
Fax 801.224.2272

870 West Center
Orem, Utah 84057

CIRCLE 116 ON INFORMATION CARD

ACURIS 3D CLIPMODELS®

Accurate, Ready To Render & Animate !



Libraries of detailed 3D models $295

1. Interior - Furniture & Multimedia.
2. Exterior - Trees & Furniture.
3. Geographic - Globe & Earth, USA, Japan.
4. Human Forms - Man, Woman, Skeleton.
5. Human Faces - Man & Child with expressions.

For PC, SGI & Macintosh systems in:
• Autodesk DXF & 3DStudio • Topas • RIB
• Wavefront OBJ • MacroModel • Others...

acuris

415 329 1920

125 University Av. St. 125,
Palo Alto, CA, 94301

Fax: (415) 329 1928

CIRCLE 118 ON INFORMATION CARD

15th Annual NOW Systems Seminar

"All You Need to Know About Electronic Prepress, Publishing, & Printing"

February 14-16, 1994 • Orlando, Florida

Let Frank Romano, Rochester Institute of Technology educator and *Electronic Publishing/TypeWorld* Editor-in-Chief, help you understand the trends, the technologies and the choices you have in creating productive systems for page preparation and printing.

Why You Should Attend:

Change is rampant. New output, input, workstations and systems are more than most of us can deal with. This personal and comprehensive 2½ day seminar, moderated by Frank Romano, will present the alternatives, insights and information you will need to make prudent decisions NOW.

To find out more, call Barrie Mirman at (508)392-2187, fax: (508)692-7806

Sponsored by
ELECTRONIC PUBLISHING
TypeWorld

Index to Advertisers

ADVERTISER	PAGE NO.	CIRCLE NO.
Acuris	117	118
Advance Reproductions Corp.	116	113
Aldus	CV4	—
Apple Computer	13	—
Ascension Technology	42	15
Autodesk	86-87	44
CalComp	11,65, 43	6,24, 16
Candela, Ltd.	115	107
Chyron	102A&B, 103	38
Digimation	116	114
Digital Pond	101	29
DigiVox	82	36
DuPont Pixel	57	20
Eastman Kodak	14-15 110-111	8 47
Fairchild Space & Defense	62	23
Faro Technologies	109	46
Fractal Design	73	31
Grabert Systemhaus	114	104
Hewlett Packard	22-25, 96-97	11, 41
Hitachi America, Ltd.	58	21
Houston Instruments/ A Summagraphics Co.	67	25
IBM Ultimedia	70,77 85	30,32 37
Imagine That	117	117
Intergraph	CV2-1	1
Iris Graphics	61	22
Management Graphics	95*	40
Media Vision	7	4
Metrum Imaging Products	31	13
Micrografx	8	5
Mira Imaging	115	108,109
Mitsubishi Display Products	4-5	3
Mitsubishi International	69	28
Mitsubishi Prof. Electronics Div.	47	17
NEC Technologies	26-27	12
Philips Consumer Electronics	98*	42
Polhemus	2	2
Raster Graphics	107	45
QMedia	81	35
School of Communication Arts	115	110
School of Visual Arts	113	102
Ron Scott	115	111
Silicon Graphics	16-19	—
SoftImage	CV3	48
SuperMac Technology	20	10
Template Graphics Software	92	39
TouchVision Systems	78	34
Vancover Film School	115	—
Viewpoint	117	116
Virtus	75	32
VITec	113	101
The Winsted Corporation	68	26

** International only*

** The Ad Index is published as a service. The publisher does not assume any liability for errors or omissions.*

Sales Offices

COMPUTER GRAPHICS WORLD

Paul McPherson
Group Sales & Marketing Mgr.
One Technology Park Dr.
Westford, MA 01886
TEL:508-392-2172
FAX: 508-692-7806

NEW ENGLAND, EASTERN CANADA, UPSTATE NEW YORK
Alan Ventura, Regional Mgr.
One Technology Park Dr.
Westford, MA 01886
TEL:508-392-2162
FAX: 508-692-7806

MID-ATLANTIC & SOUTHEAST
Daniel J. Ferro, Sr., Regional Mgr.
PennWell Publishing Graphics Group
100 Computer Ave., Suite I-15
Willow Grove, PA 19090
TEL:215-830-1465
FAX: 215-830-8778

CENTRAL U.S. & CENTRAL CANADA
Philip L. Davis, Regional Mgr.
PennWell Publishing/ATG
2625 Butterfield Road, Suite 138S
Oak Brook, IL 60521
TEL:708-575-0259
FAX: 708-575-0310

NORTHERN CALIFORNIA, NORTHWEST
John Sly, Regional Mgr.
Bill Cooper, Regional Mgr.
Boris & Sly Associates
1000 Elwell Court, Ste. 234
Palo Alto, CA 94303
TEL:415-965-4334
FAX: 415-965-0255

SOUTHERN CALIFORNIA, SOUTHWEST
Tom Boris, Regional Mgr.
Greg Cruse, Regional Mgr.
Boris & Sly Associates
2232 S.E. Bristol, Ste. 109
Santa Ana, CA 92707
TEL:714-756-0681
FAX: 714-756-0621

SOUTH CENTRAL
Randy Jeter, Regional Mgr.
19627 Interstate 45 No., Ste. 110
Spring, TX 77388
TEL:713-353-0309
FAX: 713-288-8350

LIST RENTAL
Deanna Rebro
PennWell Publishing Co., P.O.B. 1260
Tulsa, OK 74101
TEL:918-831-9551
FAX: 918-831-9497

SHOWCASE
Shirley Athorn
Direct Marketing Department Mgr.
One Technology Park Dr., P.O.B. 987
Westford, MA 01886
TEL:508-392-2183
FAX: 508-692-7831

LONDON
David T. Round
Westmead House
123 Westmead Rd.
Sutton
Surrey SM1 4JH, England
TEL:44-81-770-1100
FAX: 44-81-770-9779

PARIS
Daniel Bernard
10, rue Michelet – B.P. 279
78502 Sartrouville Cedex, France
TEL:33-13-914-6780
FAX: 33-13-914-7014

MUNICH
Johann Bylek
Verlagsburo Bylek
Stockaeckerring 63
D-85551 Kirchheim
Muenchen, Germany
TEL:49-89-903-8806
FAX: 49-89-904-3526

TOKYO
Toshio Egusa
Publinetwork Inc.
C407, 2-22-6, Tsukuda
Chuo-Ku, Tokyo 104
Japan
TEL:81-3-3536-5404
FAX: 81-3-3536-5490

KOREA
Mr. Il Chul Kim
IC & Associates
804 Shamduck Building
131 Da-Dong, Chung-Ku
Seoul, Korea
TEL:82-2-779-1539
FAX: 82-2-774-5399

TAIWAN
Ms. Candice Lo
Acer TWP Corporation
2/F No. 19-1
Lane 231, Fu-Hsing North Rd.
Taipei 10445, Taiwan
TEL:886-2-713-6959
FAX: 886-2-715-1950

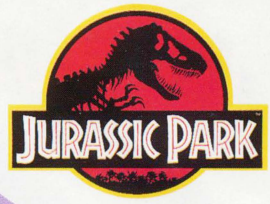
SINGAPORE
Mr. Mike Seah
Bell Associated Agency
7500A Beach Rd. #06-322
The Plaza,
Singapore 0719
TEL:65-299-0413
FAX: 65-296-6629

HONG KONG
Mr. Tom Gorman
CCI Asia-Pacific Ltd.
Ste. 905,
Guardian House
32 Oi Kwan Road
Happy Valley, Hong Kong
TEL:852-833-2181
FAX: 852-834-5620

COMPUTER GRAPHICS WORLD (USPS 665-250) (ISSN-027-4159) is published monthly by PennWell Publishing Company, 1421 South Sheridan, Tulsa, OK, 74101. Editorial & Production offices at One Technology Park Dr., Westford, MA 01886. Officers of PennWell Publishing Company: Frank T. Lauinger, Chairman; Joseph A. Wolking, President & Chief Executive Officer; L. John Ford, Senior Vice President; Dr. Morris Levitt, Senior Vice President; John Maney, Vice President Finance; Steve Zimmerman, Vice President Corporate Services; Raymond Leung, Vice President Planning & Business Development. Second-class postage paid at Tulsa, OK 74112 & additional other mailing offices. *COMPUTER GRAPHICS WORLD* is distributed worldwide. Annual subscription prices are $48, USA; $59, Canada & Mexico; all other countries, $69 airfreight to Europe; $91 airfreight to Asia Pacific, surface to balance of world (for airmail service add $35). To order subscriptions, call (800) 331-4463.

© 1993 *COMPUTER GRAPHICS WORLD* by PennWell Publishing Company. All rights reserved. No material may be reprinted without permission. Microfilm copies are available through University Microfilms Inc., Ann Arbor, MI 48106. Authorization to photocopy items for internal or personal use or the internal or personal use of specific clients is granted by PennWell Publishing Co. for users registered with the Copyright Clearance Center Transactional Reporting Service, provided that the base fee of $100 per copy plus $0.35 per page is paid directly to CCC, 27 Congress St., Salem, MA 01970. The *COMPUTER GRAPHICS WORLD* fee code for users of the Transactional Reporting Services is 027-4159/87 $100 + .35.

POSTMASTER: Send change of address form to *COMPUTER GRAPHICS WORLD*, Circulation Dept., P.O.B. 122, Tulsa, OK 74101.

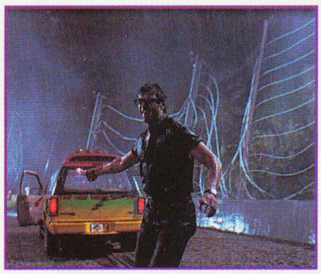


HOW DO YOU *move* AN **80 TON** DINOSAUR?

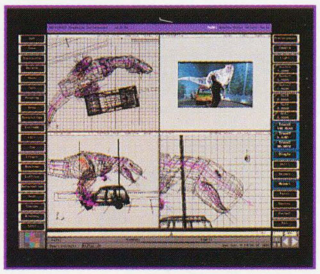
Answer:

INDUSTRIAL LIGHT+MAGIC™

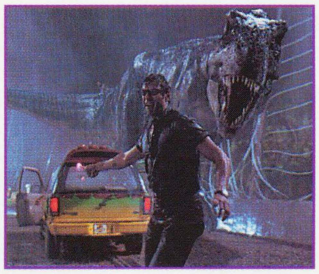
using **SOFTIMAGE**



A film plate of a Jurassic Park scene is shot on location. Jeff Goldblum runs from ... nothing.



The T-Rex is animated using SOFTIMAGE's inverse kinematics, and added to the scene.



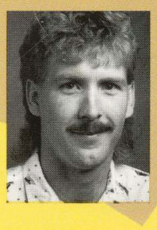
The rendered version of the dinosaur is digitally composited with the live action.

SOFTIMAGE Inc. 3510, boul. St-Laurent, suite 500, Montreal, Quebec, Canada H2X 2V2 Tel • (514) 845-1636 Fax • (514) 845-5676
Industrial Light & Magic P.O. Box 2459 San Rafael, California 94912 Tel • (415) 258-2000 Fax • (415) 454-4768

CIRCLE 48 ON INFORMATION CARD

LET ALDUS HELP YOU AVOID A BAD TRAP

"TrapWise has speeded up our work immensely. It has changed trapping from a laborious, mechanical process into one where I can still apply all of my stripping knowledge but make my computer do all the tedious work. It's an incredible timesaver."



Todd Morton
Electronic Prepress Specialist
Impression Northwest
Commercial Printers
Seattle, Washington

Fast. Accurate. Cost-effective. Profitable. Aldus® TrapWise™ for Windows provides production professionals extensive control over trapping results. TrapWise immediately creates chokes and spreads for PostScript files, and accepts color-conforming EPS files from Macintosh, Windows, and Unix platforms. It can even trap blends and show traps on-screen for evaluation of custom trapping. Now you can quickly and easily trap even the most complex artwork. TrapWise costs $4,995. Aldus offers 90 days' complimentary technical support to purchasers of Aldus PressWise™, Aldus TrapWise, and Aldus PrePrint®.

PLEASE CALL (800) 685-3568 FOR YOUR NEAREST GRAPHIC ARTS DEALER, TO RECEIVE MORE INFORMATION, OR TO ORDER A TRIAL VERSION.

ALDUS® TRAPWISE™

ALDUS®

Power tools for the trade professional

© 1993 Aldus Corporation. All rights reserved. Aldus, the Aldus logo, and PrePrint are registered trademarks and PressWise and TrapWise are trademarks of Aldus Corporation. Other product and corporate names may be trademarks or registered trademarks of other companies, and are used only for explanation and to the owner's benefit, without intent to infringe.